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AGRICULTURAL EDUCATION FOR TEACHERS

BY

GARLAND ARMOR BRICKER, B. Ped., M.A.

ASSISTANT PROFESSOR OF AGRICULTURAL EDUCATION
COLLEGES OF EDUCATION AND AGRICULTURE, OHIO STATE UNIVERSITY
AUTHOR OF "THE TEACHING OF AGRICULTURE IN THE HIGH SCHOOL"
AND "SOLVING THE COUNTRY CHURCH PROBLEM"
MANAGING EDITOR OF "THE RURAL EDUCATOR"

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BRICKER'S AGRIC. EDUC.

W. P. I

TO MY WIFE
MABEL McCLELLAND BRICKER

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PREFACE

THE March winds have passed in agricultural education. The sudden sallies of transient flurries with their bluster are now rapidly giving way to the quieter days of summer. A more sober purpose is vitalizing and systematizing the work of agricultural teaching, and with each passing year less emphasis is being placed on exploitive methods.

Prejudice, inertia, and misgivings are everywhere gradually yielding place to the new rural education. Country communities are demanding that their schools educate in terms of rural life; normal schools are rapidly instituting and perfecting departments for the training of rural teachers; and the colleges are offering courses in rural leadership, and in the teaching of agriculture, home economics, and farm manual training. Tens of thousands of teachers have suddenly become conscious of the new demands that are being made on them. Not all may take advantage of the facilities offered by the higher institutions of learning, while many who take brief courses in summer sessions feel the need of keeping in constant touch with the new ideas in agricultural education along its fundamental lines of development.

Teachers in active service, as well as prospective

teachers in training, it is hoped, will profit by the reading and study of this book, in which are recorded the knowledge and wisdom gleaned from a decade of experience, observation, and study. The book is not the final word on agricultural education, but may be considered a handbook for the teacher, and a guide-book for the district and the county superintendent and the supervisor of rural or agricultural education.

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G. A. B.

AGRICULTURAL EDUCATION FOR TEACHERS

CHAPTER I

THE RISE OF POPULAR EDUCATION IN AGRICULTURE

Agriculture is the most recent of the sciences; and through the application of its principles to the production of food, clothing, and shelter, or to the satisfying of man's æsthetic desires, the most ancient art of agriculture has had a new birth. From this grand old industry, over forty millions of our people daily draw their wealth and inspiration for higher and better living. Without this basic source of wealth, our people could not continue to support our highly developed Christian civilization through another year. To insure the perpetuity of an intelligent agriculture for the generations of our people who shall inherit and till the God-given acres of the nation after we have quit them, it becomes an inevitable duty of the state to educate her youth in this wonderful science and noble art.

Agriculture, as a school subject, has been long in coming; but some notion as to how long it will stay with us may be gained when we reflect how long mankind will continue to draw its sustenance from the

soil. When one considers that there will be need for a greater quantity of agricultural products as the population of the earth increases, and that, with the advance of time, agricultural products may be produced with ever increasing difficulty, the future importance of this subject may be more clearly understood. Agriculture "has come to stay," and—it may be said more truthfully now than ever—into the hands of the teachers of the state has been thrust its destiny.

The demand for popular education in agriculture came suddenly. Its rise and triumph have been accomplished almost in one decade. After half a century of propagandism in favor of popular education in this subject by the land-grant colleges, the United States Department of Agriculture, the agricultural experiment stations, and other agricultural organizations, the public mind has been placed in a receptive attitude. When small beginnings in public school agriculture were made in various localities over the country, the people took kindly to the new undertaking, or, at least, did not actively oppose it. In some communities a genuine enthusiasm was engendered by its introduction into the school courses. From these small beginnings, the enthusiasm for the study and teaching of elementary agriculture began to spread, gaining rapidly in force as time went on. From 1900 to 1905, the tide rose very rapidly, and during the following half-dozen years a veritable flood of public sentiment for the teaching of this branch in the schools swept the country.

The sudden impetus given to popular education in agriculture has found thousands of teachers unprepared to teach the subject. Apparently without warning, laws have been passed requiring the teaching of agriculture in both the elementary and the high schools, and, in several instances, teachers have been required to take examinations in this branch with almost no opportunity to prepare themselves for the ordeal.

Although teachers are unprepared and schools unequipped to teach the elements of agriculture, the gigantic task must be attempted and somehow accomplished. A few leaders have blazed the way, popular clamor has rapidly followed, and the American school teacher dares not turn backward. Our teachers have never yet failed the nation, and never will. Tens of thousands are wearing out their lives at the post of duty, and, as Little Peterkin held back the threatening waters of a roaring sea, so they are holding back the black sea of ignorance from engulfing a people. The American schoolman does not perform things by halves. This new agricultural education is to him an opportunity to render greater service.

Review of Chapter I

What can you say concerning—

1. The importance of agriculture as a school subject?
2. The rise of popular education in agriculture?
3. The unpreparedness of teachers to teach agriculture?
4. The spirit with which teachers are preparing themselves to teach agriculture?

CHAPTER II

THE PROBLEM OF INTENSIVE AGRICULTURE [1]

One reason why agriculture should be taught in the public schools is that, as a nation, we must begin to work out the solution of the problem of intensive agriculture. The rich virgin soil that our fathers, grandfathers, and great-grandfathers first cultivated in America is being rapidly impoverished. The fertility of our soil is being exploited just as are our other natural resources of the forests, the mines, and the rivers. By wasteful and unscientific methods of farming, we are preparing to transmit an impoverished soil to the future inhabitants of this country. Even now, there are many abandoned tracts of land that may be purchased at ridiculously low prices. Already there are agrarian conditions, caused by an exhausted soil, that should not exist within the boundaries of our country. In the past we have been exploiting our soil; from henceforth we must endeavor to conserve its fertility to the end that the conditions of life may be ameliorated for the multitudes of our race that shall inhabit this land after us.

We have much to learn from other nations in matters

[1] See *Educational Review*, Vol. 41, pp. 359–403, April, 1911, where a portion of this and the following chapter were first published.

agricultural. The Germans, from fields that have been tilled for the past thousand years, are able to produce an average yield of twenty-eight bushels of wheat per acre; while we Americans, from a new soil that has been farmed only one tenth as long—about a century—are producing an average yield of only fourteen bushels of wheat per acre. The Chinese can do still better than the Germans. In that ancient and crowded country of China, the inhabitants have been driven to find a solution for the problem of intensive agriculture; and even there, owing to a limited scientific knowledge, there has been no complete and satisfactory solution of this problem. A case has recently been reported [1] of a Chinaman, who, from two and one half acres—which, in China, is considered a good estate—supports himself, his wife, ten children, one donkey, one cow, and two pigs. Can any Anglo-Saxon living accomplish such a feat? Consider what an American farmer might do with a forty-acre farm, if he understood the science and art of agriculture as does the Chinaman. He might feed, clothe, and shelter thirty-two adults, one hundred and sixty children, sixteen donkeys, sixteen cows, and thirty-two pigs,—and then have enough left to spend on improvements and pay the necessary taxes. In this comparison the advantage would be on the side of the American, because he would have a better soil and the use of labor-saving machinery.

[1] King, F. H.: *Farmers of Forty Centuries*, p. 3. Mrs. F. H. King, Madison, Wis., 1911.

The American people of the future must either learn the lesson of intensive agriculture, or starve, or fight. These three are the only alternatives. During the past history of this nation our population has, on an average, doubled each twenty-five years. The returns of the latest census show a population of about 91,000,000, for the contiguous North American territory. If our people continue thus to increase during the next century, the United States will have the enormous population of 1,456,000,000 persons within her borders in A. D. 2010—and all this multitude must be fed, clothed, and sheltered by the products from the same area that we now possess, large portions of which are of doubtful value, and other portions depleted of fertility.[1] By our present methods of agriculture, it will be impossible to supply the necessaries of life. The average density of population will be 480 persons to the square mile, or nearly equal to the most densely populated country of Europe,—and Belgium does not raise nearly enough from her area to feed, clothe, and shelter her people, but the raw materials for doing this must be supplied by commerce from less densely populated countries. There are no more new lands to be discovered and subdued to which our children's children may migrate as did our grandfathers. The people of that future day will, therefore, be compelled to prac-

[1] In this connection see what Dean Eugene Davenport has to say on the same thought in his *Education for Efficiency*, pp. 152 et seq. D. C. Heath & Co., Boston, 1910.

tice successfully an intensive agriculture, or starve, or wage a war of extermination upon other races of mankind in order to secure additional areas from which to subsist.

It may be argued that our people will not increase so rapidly in the future as they have in the past. We have, however, no assurance of that fact. The increase in the population of the United States is due to two causes: the immigration of foreign peoples and the natural reproduction of our own native races. It is doubtless true that, as time advances and this country becomes more densely populated, there will constantly be an ever-increasing backward pressure on immigration until finally an equilibrium will be reached. This equilibrium will be attained when all portions of the earth, where the struggle for existence is equally severe, are populated with an equal density. But, while our area is being more thickly populated, other countries will continue to experience a more and more dense population through the medium of natural reproduction, and this will tend to favor immigration, perhaps for several centuries, unless preventive legislation interferes.

On the other hand, with the tendency of our country to maintain peace with the nations of the world, there will be less destruction of human life from the source of war and its attendant diseases and calamities, while the virility of the sex instinct gives no serious evidence of diminution. The present indications are that, with

respect to the increase of human beings, history will repeat itself. Even if the tremendous population anticipated is not realized within the time above mentioned, yet it is certain to come, if a century more of time is needed, thus making the precautions here apprehended equally valid.

Let a modern example be cited to show that the apprehension of an over-population is not a mere phantom. Since Japan threw her doors open to the nations of the world, she has had a wonderful increase in population. During the past thirty-five years she has had a total increase of about sixteen millions. Her latest census returns (1908) show a population of 49,581,928, or 336 persons to the square mile.[1] As large portions of the island empire are not arable, it has come to pass during recent years that the nation is unable to produce enough food for its own inhabitants. Most of the imports are foodstuffs. The tiller of the soil has been forced to obtain a living from the products of a very small area of land—the average holding for each family being two and one half acres.[2] The system of tillage is extremely thorough, two and even three crops being raised annually on one piece of land where climatic conditions permit. We

[1] Yamawaki, Haruki: *Japan in the Beginning of the Twentieth Century*, pp. 48–50. Tokyo-Shoin, Tokyo, 1914. See also *Statesman's Year-Book* for 1910.

[2] Alfred Stead: *Japan by the Japanese*, p. 413. Dodd, Mead and Company, New York, 1904.

thus see that, during the opening years of the twentieth century, there existed an economic necessity for expansion.[1] The immediate agricultural possibilities of the nation had reached their limit. The acquisition of other lands was necessary, or starvation would be the inevitable lot of a portion of the people. The solution of the problem was reached by the forced annexation of Korea to the empire of Japan, and the emigration of large numbers of the Japanese to that sparsely inhabited peninsula.

Our Anglo-Saxon civilization cannot be supported on a hungry stomach, or an unclothed or unsheltered body. Our people must have ample food, clothing, and shelter, if they are to continue the development, or only the support, merely, of our very complex and high state of civilization. Better a hundred years for our country to grow in than, like Rome, a century in which to decay. Now is the time to begin to learn the great and vital lesson that is sure to be forced upon future generations. This is one of the numerous reasons why many states are getting ready to teach the subject of agriculture in earnest in their schools. It not only is a means of present prosperity, but will, it is hoped, eventually result in the amelioration of the conditions of life for the thousands who are to come after us. Sooner than any other class of citizens, the American school teachers should awaken to their re-

[1] F. A. McKenzie: *The Unveiled East*, p. 10. E. P. Dutton & Company, New York, 1907.

sponsibility in this matter of popular education in agriculture, and rise to make an opportunity for the introduction of this subject into, and its maintenance as a part of, the program of studies in our public schools.

Review of Chapter II

Give reasons why—

1. Agriculture should be taught in the public schools.
2. The Germans and the Chinese are better agriculturists than the Americans.
3. We, as a nation, must learn the lesson of intensive agriculture, or starve, or fight.
4. Natural increase in population, immigration, and peace will tend to increase the seriousness of the problem.
5. Japan was forced to solve her agrarian problems with war.
6. The teachers of America should respond to the call of agricultural education.

CHAPTER III

A POPULAR SCIENTIFIC AGRICULTURE

There can be no intensive agriculture without a scientific agriculture. The conservation of the fertility of the soil implies the application of scientific methods to the art of plant and animal production. These two things are inseparable; for the former is a result that may be obtained only through using the latter as a means. Before the state can realize the benefits of an intensive agriculture, it must first produce a generation of farmers who are educated in the principles of the science and art of agriculture.

Unscientific agriculture is wasteful. Just as an automobile may be wrecked by an unskilled person who does not understand the principles of its operation and has not acquired the necessary practice in such operation, so the soil may be depleted of its fertility by being farmed by one who does not understand the underlying principles of soil fertility and the proper methods of soil management. Likewise improper methods of feeding and caring for live stock, and the disposal of animal products, will not secure the highest returns.

Farmers should approach their life's work with a thorough understanding of its underlying principles,

and this knowledge can be received by the vast majority of farmers' sons only through the instruction which is obtained through the local public school.

The conservation of soil fertility must be emphasized and universally taught. Should the farmers of the nation disregard this need, results more dire than those apprehended from over-population would overtake us. The unscientific management of the soil would surely serve to hasten the impending calamity. Let an example be given. Soil is rarely cultivated more than eight inches deep. Most of its available fertility comes from the first twelve inches of the surface. Although the roots of plants are known to extend many feet into the ground, yet these deep penetrations are mostly for the purpose of securing additional water. The plant food which this deep soil moisture holds in solution may, in general, be said to have been dissolved by it as it passed through the upper layers of the surface. The average chemical analyses of a large number of various soils show that the first eight inches of an acre of ground contain the three most limited, but positively essential, plant foods in round numbers as follows: nitrogen, 3,000 pounds; phosphorus, 4,200; and potassium, 16,300.[1] Furthermore, the amounts of these elements removed yearly from an acre of soil by leading crops, are, in round numbers, as follows:

[1] Roberts, Isaac Phillips: *The Fertility of the Land*, p. 14, 1906. The Macmillan Company, New York.

APPROXIMATE AMOUNTS OF THE THREE MOST LIMITED FERTILIZERS REMOVED ANNUALLY FROM AN ACRE OF SOIL BY CERTAIN CROPS.[1]

Crop	Nitrogen pounds	Phosphorus pounds	Potassium pounds
Corn, whole plant, 50 bu.	75	15	35
Wheat, 25 bu.	45	10	30
Potatoes, 200 bu.	40	10	60
Tobacco, 1600 lbs.	75	15	200
Timothy hay, 1½ tons	35	5	35

A soil is exhausted for plant production when any element in the soil necessary to plant growth is no longer available. This availability ceases long before the total supply is exhausted. Although the residue is capable of being released by chemical processes, it may not be in a soluble condition, and is, therefore, unavailable to the plant. Furthermore, long before all the available plant food is exhausted, the area of ground becomes economically unproductive—or produces uneconomically. Supposing, however, that all these elements chemically shown to be contained in the first eight inches of soil are available, that no additions of these elements are made from any source, and that the production of crops

[1] Cf. Hopkins, Cyril G. *Soil Fertility and Permanent Agriculture*, p. 154, 1910. Ginn and Company, Boston. Also, Van Slyke, Lucius L., *Fertilizers and Crops*, p. 177, 1912. Orange Judd Company, New York.

from an acre would be profitable until the entire amount of any of these fertilizing elements were used up, we may readily calculate from the preceding table how long it would take to exhaust the soil (first eight inches) completely. In the case of corn it would take about 40 years, for the complete supply of nitrogen would then be exhausted; in the case of wheat, this exhaustion would result in about 66⅔ years. Suppose that in the cultivation of tobacco, the nitrogen and the phosphorus supplies were to be maintained but the potassium supply were allowed to diminish. In just 81 years, according to the data given and the conditions assumed, tobacco would cease to grow to maturity.

It will not be necessary to continue these crude estimates any further to emphasize the necessity of securing a universal recognition of the importance of conserving the fertility of the soil. With the dawning of the day of intensive cultivation for all the arable soil of the country, must also come the universal education of the farming classes in the scientific principles and practices of husbandry. This means complete democracy in agricultural education for rural people; and the public school is now the only known institution through which this task can be efficiently and successfully accomplished.

In almost every community there are one or more examples of farmers who continually persist in "bringing up the rear." They are always late in the most important and regular operations of the farm, such

as planting and harvesting corn, wheat, and oats, making hay, selling hogs and crops, paying taxes and debts. They seem somewhere to have lost one or two weeks out of their lives and have never been able to catch up. In most cases this affliction seems to have been "transmitted" from father to son for two, three, and even four generations; and to-day there are still a few farmers in our midst who are suffering the penalty of the "behind-time" sin that was committed by some ancestor during the latter half of the eighteenth century! The seasons, like time and tide, wait for no man. To-day, as in the past, there are too many farmers who are content to follow in the footsteps of their fathers and grandfathers, no matter whether their practices of agriculture were good or bad. It is this unscientific practice of blindly following the habitual methods of farming, whether right or wrong, without knowing or considering the reasons why, that the teaching of agriculture in the rural, elementary and secondary schools is designed to remedy.

In 1862 the Congress of the United States passed the Morrill Act by the provisions of which the first state agricultural colleges were established. These institutions have been doing an admirable work for over half a century, but they have not succeeded in reaching, as they should, the practical needs of the mass of farmers. This failure is recognized by both the agricultural colleges and the rural population. These higher institutions are too far removed from the common

farmer and it is the common farmer, his daughters that must somehow be reached

On the other hand, an effort has been m the country people through the teachi study in the elementary schools. Unfort instruction given in this subject usually a very meager knowledge of the principles tices of real agriculture. It has been, ai pursued for the avowed purpose of getting a with a few of the more striking phases of na , and its aim is chiefly æsthetic. The most fundamental and elementary principles of agriculture are not touched and never would be learned, if we depended upon nature study for them.

The only way, then, to reach the masses and impart to them the knowledge of the scientific principles of agriculture is through the medium of the public schools. Here the present generation of farmers' sons and daughters, and the young people of the cities who may become interested in farming and country life, may be taught the theory and practice of scientific agriculture. That the instruction in the elemental principles of agriculture in the public schools does give effective results is no longer a theory to be demonstrated at some future time, but we have evidence that it makes such results a matter of history. One reason why the people of Germany secure such good returns from their soil is attributed to this cause. More striking still is the fact that European peasants

who migrate to America from Germany, Belgium, Holland, France, Denmark, and Sweden invariably outstrip our native farmers in raising crops. They know the essentials of spraying, tillage, soil fertility, feeding, breeding, etc. They have been taught these things from their youth up in the public schools of their native lands. It is indisputable that immigrants from the north-European countries have converted into productive, thriving, and well-stocked farms, lands upon which the average American farmer could not have subsisted. In New England, these people are even now beginning to reclaim the abandoned farmsteads, and once more the fields of the Pilgrim Fathers are to bloom and bear fruitage. "Nor should this success be attributed—as it so often is—to a lower scale of living on the part of the foreign-born farmer. The real secret of their success is thrift and knowledge of the essentials of scientific farming. Americans should take the lesson to heart, for in this respect Europeans can yet teach us important educational facts." [1]

Scientific agriculture, as it should be taught in the schools, prepares for the business of farming. About one third of our people are engaged in this business, and there will always be a large percentage of them employed in the noble work of providing food and clothing for mankind. In the various professions, as in

[1] See H. W. Foght: *The Rural School of the Twentieth Century*, pp.185–6. The Macmillan Company, New York, 1910.

law, medicine, teaching, and preaching, men have long realized the necessity for a more or less thorough preparation before beginning active work in these callings. Even in the trades, young men are compelled to serve a term of apprenticeship before they are enabled to perform the work of a master mechanic. In agriculture, however, the matter has been quite different. We used to say, "Anybody can farm." That was only another way of saying that every one knew all there was to be known on the subject, and, as there were but few principles and facts to be followed, almost anybody could engage in the industry with assured success. But we no longer speak as we used to. During the past half-century, the agricultural colleges and experiment stations of the nation have been ferreting out the facts of nature, and from these have been drawn many principles and laws applicable to plant and animal production. There is now a large body of facts, principles, and laws that are being pedagogically organized for the purpose of agricultural instruction in the rural, elementary, and high schools.

It takes brains to farm. A twentieth-century farmer must have more or less thorough knowledge of botany, zoölogy, chemistry, physics, meteorology, bacteriology, geology, mechanics, veterinary medicine, law, economics, and business,—besides a knowledge of the branches usually taught in the elementary schools. Men that farm by rote seldom make good farmers. Not all the duties of the farm can be reduced to au-

tomatisms, because they are too many and too varied. A large share of them depend upon the natural conditions of weather, soil, air, and sunlight. Some of the farm work may be done indoors, but most of it is done under the open sky. To perfectly adapt and successfully apply the principles of agriculture under these varied conditions, which are multitudinous in number, one must have a superior intelligence—an intelligence above that of the average man. In the factory, the shop, the office, and the store one does not meet with such an infinite variety of conditions. The store has its regular system and routine; the office, its regular business forms and card indexes; the shop, its comparatively small round of labor; and the factory, a single, simple piece of work for each person. Not very complex thought processes are involved in the work of the man who operates a single machine in a factory from day to day throughout the year, or who plugs the air holes in the tin cans in a canning factory; nor of the woman who sews the single seam in a certain garment, or who operates the typewriter eight or ten hours a day. Indeed, the young man who aspires to the high place of an agriculturist needs a more thorough preparation than the common laborer, the clerk, or the artisan.

Review of Chapter III

What relationship exists between an intensive and a scientific agriculture? Why is an unscientific agriculture

wasteful? Why should the conservation of the fertility of the soil be universally taught? How long does it take to deplete the soil with some of the common crops of the farm? What is the nature and the penalty of the behind-time sin? Why have the agricultural colleges and nature study teaching failed to reach the masses of farmers? What is the plan advocated for reaching the rank and file of the country people? What proof have we that the plan will work? Why is it more essential for the farmer of the future to be educated in agriculture than it was for his ancestors? Why does it take brains to farm?

CHAPTER IV

THE QUALIFICATIONS OF THE TEACHER OF AGRICULTURE

Everywhere teachers are looking *out* for first aids in teaching agriculture, when they ought to be looking *in*. The *first* aids come from within, and consist of those peculiar, personal characteristics that are essential to success in any given undertaking. With reference to rural and agricultural matters these qualities are indigenous to the soil and the open country; city influences and environment tend to drive them out of the lives of men, but the free and open life of the farm fosters their growth and development. Some persons are capable of acquiring these rural qualities, while others are not. There are certain other qualifications that can be attained only by the process of formal education. In reference to the teaching of agriculture in the public schools, let us see what the most important of these various attainments are.

1. Rural mindedness.—Of the many characteristics that a teacher of agriculture should possess, one of the first and most essential is that of *rural mindedness*. This characteristic is a kind of spiritual possession and manifests itself in a love for things rural. If we love boys and girls who have been reared on the farm;

if we react sympathetically toward their environment; if we take a genuine delight in the growing of wheat, corn, potatoes, beans, and other crops of the field and garden; if we feel kindly toward horses and cattle, sheep and hogs, turkeys and chickens; if we are interested in the plow, the mower, the binder, the wagon, the corn cutter, the separator; if we appreciate the need of properly locating buildings, ditches, fences, gates, and driveways; if we realize that business methods must be applied to farm operations; if we are not repulsed by a pair of overalls or by digging in the soil with our hands; if we like to hoe, spade, rake, plow, pitch hay, milk cows, chop wood, and haul manure,—if we are attracted by these things, we are rural minded. If these things are repulsive to us, then we are not yet ready to teach agriculture most effectively to the boys and girls of the country.

Seek first to become rural minded. It is a spiritual quality that may be acquired; be, therefore, not discouraged, if you chance to find yourself out of tune with the rural environment of the children that you are to teach. Open your mind and heart to the sweet and strong influences of country life, accept the rough exteriors as signs of sturdy characters beneath, and, mayhap, you too, will be granted the useful and happy life and experience of the farmer.

2. Enthusiasm.—If one has the spirit of the farmer, then he is likely to attain its manifestation: he will be enthusiastic about rural life and the objects through

which it expresses itself. He will have a wonderful vision of ripe grains, luscious fruits, fine stock, fertile fields, warm and neat clothing, comfortable homes, efficient schools, prosperous churches, good citizens, and a Christian people rising as by magic out of the materials and the labors with which the farmer so joyously employs himself. Every young teacher should remember that enthusiasm for the new gospel of agricultural education, will, at the beginning of his career, cover a multitude of pedagogical sins and a heap of ignorance. Better than that, it will also start him to work; and if he is made of the right kind of stuff, no one need be fearful of the outcome.

3. Harmonious adjustment.—In many instances, especially with women teachers, there must be a genuine desire for readjustment. All their lives, many of them have been out of harmony with their own and their children's environment. They have been out of tune with the farm life, and many need retuning. For instance, the silly fear of toads must be dropped. And how, indeed, can a teacher who is afraid of cows, successfully teach the many practical lessons in animal studies! There are teachers who, perhaps all their lives, have regarded swine as dirty and repulsive beasts, and yet who relish a fine pork roast. "What God hath cleansed, make not thou common."

Besides attaching repulsive attributes to certain objects of the farm, many people are in the habit of thinking of certain other things in the spirit of vulgar-

ness. What a noble animal is a prize bull! And yet some prudes slander him by calling him a "steer". Let us, as intelligent men and women, divorce all vulgar thoughts from the words: hen, mare, ewe, sow, jenny, rooster, buck, bull, stallion, ass, teats, stud, manure, and a score of other terms of the farm that ought to be inviolable, because they represent things that are essential to human life. Let us call things by their right names in a natural way. Evil thoughts are not inherent in these terms, although it must be admitted that they are often found associated with the vice sores in the minds and hearts of some persons.

4. Professional knowledge.—The true teacher will need more than the spirit of rural mindedness, its resulting enthusiasm, and a harmonious adjustment to farm life. He will need correct professional knowledge of what to teach, and how and when to teach it. There are many facts and principles included in the great fund of agricultural knowledge that should be taught in the elementary school; there are a great many more that should not be attempted there, and any effort to teach them will result in inevitable failure. There are certain seasons when certain things agricultural may best be taught, and to neglect or disregard this fact is folly. There are pedagogical methods of approach to the mind of the child by means of a scientific (pedagogically speaking) sequence of the materials. To blunder in this regard may result in the defeat of the effort to establish desirable

knowledge, habits, aims, and ideals in the mind and the life of the child. Laboratory and industrial methods of instruction must be employed, because agriculture is a physical science and deals with the most common materials that enter into the experience of country children. There is the art side of the whole field of agricultural education, which is equally important with the science side, and to teach the science of agriculture to the neglect of the art of agriculture will place a one-sided emphasis upon the whole subject.

Review of Chapter IV

Discuss—The first aids in the preparation to teach agriculture. Rural mindedness. Enthusiasm. Harmonious adjustment. Professional knowledge.

CHAPTER V

THE PREPARATION OF TEACHERS TO TEACH AGRICULTURE

The work of preparation to teach agriculture in the public schools in compliance with the demands of the times, is now one of the chief considerations of no fewer than one hundred thousand teachers in the United States, and it is quite probable that the number of such teachers is much greater. Multitudes of teachers are seeking to know how they may most quickly prepare themselves to teach this subject in order to hold their positions, to pass examinations, to seize opportunities to rise in their profession, to become more efficient teachers of agriculture, or to secure popularity. Thousands of supervisors—especially village, township, county, and state superintendents—are considering ways and means of accomplishing this gigantic undertaking, if happily, they are not confronted with the more serious task of acquiring some degree of training in this subject for themselves. When we consider that the demand is insistent, that the preparation must be immediate, and that with the great majority of teachers, this preparation must go forward while they are in service, we begin to realize the seriousness of the situation that now confronts us.

This view of the situation may seem rather discouraging, but we are only reviewing conditions as they really exist. To seem pessimistic is not intended; only the seriousness of our problem must not be overlooked. It is through optimism, and not pessimism, that great problems are solved. The task of aiding teachers to teach some agriculture in the public schools is before us and something must be done at once. Of course, not much can be accomplished in the short space of time that popular clamor will give to us for this purpose, because it will be a decade before agriculture is taught in the public schools as it should be. The magnitude of the problem is such that this cannot be otherwise. It becomes necessary, therefore, to make use of every available means of at once getting the teaching forces of the country "into the harness."

Two motives will guide teachers in their efforts to prepare for teaching agriculture: namely, preparation to satisfy some extraneous desire, as the retaining of a position, the passing of an examination, or the attaining of some degree of popularity; and preparation to teach agriculture for the sake of becoming a more efficient teacher. For the vast majority of teachers the attainment of any extrinsic object, as the preparing to take an examination in agriculture, for instance, will not be synonymous with preparing to teach the subject to the pupils in the best possible way. The attainment of the latter aim requires a gradual, systematic, and progressive pursuance of the elementary

and fundamental facts, principles, and processes of agriculture after some organized plan; besides this, time must be given to work over all this science and art into lesson plans for teaching purposes. The preparation-for-examination aim involves the memoriter method of learning definitions and static facts. It also necessitates an extensive and hurried excursion over the field of knowledge involved, in which little depth is attained, and it invariably results in distorted notions about related topics; while the processes, which form a very important part of education in agriculture, cannot be experienced. A preparation of this sort is universally condemned by the foremost educators. We shall, therefore, allow this motive to preparation to pass from our consideration and recall the first, which is the real one,—the preparation to teach the subject in the best way. All other motives should be entirely subordinated and made only incidental to this.

The imparting of professional knowledge in its twofold phase of content and method is the great problem in the formal training of teachers to teach agriculture. They must know the things they teach. Scholarship is the first requisite to the true success of a master teacher. Furthermore, the necessity of having a generally accepted working philosophy of teaching agriculture in the public school is very urgent. Though not now the most immediately urgent, the greatest problems of teaching agriculture in the

public schools are pedagogical, and not those of a technical scientific nature. An enormous mass of scientific agricultural facts, principles, and laws has been discovered and formulated by the agricultural colleges and experiment stations during the past half-century. The problem of choosing and adapting a portion of this knowledge and practice for use in public elementary and secondary schools has not yet been fully solved. Agricultural teaching is still in its infancy. The best methods of teaching elementary and secondary agriculture are now in their inception, and teachers, generally, have given little attention to the pedagogy of industrial subjects.

Preparing to teach agriculture, then, involves two phases: namely, the learning of the facts and principles of agriculture, coupled with experience in farm practice, and the learning of the pedagogy of agriculture, which also involves theory and practice. The close coördination of these two phases of training in the preparation of teachers to teach agriculture is essential.

Review of Chapter V

Explain—The magnitude of the work of preparing teachers to teach agriculture. The two motives that prompt teachers in preparing to teach agriculture. The great problems in the formal training of teachers to teach agriculture. The two phases involved in agricultural teacher-training.

CHAPTER VI

AGENCIES FOR THE PREPARATION OF TEACHERS

A BRIEF consideration of the various ways and means available for the preparation of public school teachers to teach agriculture may prove helpful.

1. Home study is always a source of help to earnest teachers who have the inclination, the initiative, the persistence, and the self-denial necessary to pursue it. Those who intend to direct their own work are advised to select for consecutive study a good elementary or secondary textbook, of which there are now several on the market.[1] This study should be supplemented with the reading of bulletins from the colleges of agriculture, the agricultural experiment stations, and the United States Department of Agriculture on the various topics treated. Moreover, constant and careful reference should be made to the objects and practices on a farm managed by a good farmer, which should be regarded as the indispensable laboratory of the course. This method of preparation is to be recommended only to those teachers who have no other opportunity open to them.

Under this head should also come the home study

[1] See pp. 41–42, for a list of recommended books.

carried on under the direction of correspondence schools and the correspondence courses of land-grant colleges, and the progressive and often truly constructive work accomplished through the medium of efficient teachers' reading circles.

2. Teachers' institutes, if competent instructors in agricultural education are available in sufficient numbers, may offer some help. This means of instruction may become more important as teachers increase their knowledge of agriculture. However, ten well selected, typical subjects, with a liberal use of practical exercises, properly treated in a one week's session of a teachers' institute, may not only be a means of inspiration to the teachers, but may serve to direct them in their teaching by indicating proper methods; may be of assistance in the further pursuit of the subject of agriculture begun at the institute and may explain many things not before understood. Officials in charge of teachers' institutes are everywhere beginning to employ instructors in agricultural education, and the serious efforts that are being made in many places to reclaim the institute from the domination of the mere entertainer are to be commended.

3. Teachers' meetings.—There are in every state, a few superintendents, high school principals, and teachers, who are qualified to give some good, practical work in agriculture to the teachers in their respective communities. Under the leadership of these persons, the teachers of a community may do much effective

work during the months of active service. One instance especially comes to mind. In Ohio, a superintendent of village schools, who is also a district superintendent, held regular, weekly meetings of all the teachers under his supervision, for the purpose of giving instruction in school agriculture. This man had taken courses in agricultural education and teaching at a summer session of the state university; and from week to week in teachers' meetings, he presented the materials of instruction by the very methods that the teachers were expected to use in the teaching of the same lessons to their pupils. The school work in agriculture in the community under the jurisdiction of this superintendent for that first year proved very satisfactory. A similar plan is recommended to other superintendents who have at heart the good of the teachers and pupils under their supervision.

4. The summer sessions of nearly all universities, colleges, and normal schools now offer courses in agriculture. The work is usually given by specialists in agricultural teaching, and their instruction is of a very high character. By earnest application during one summer, hundreds of teachers have secured a sufficient preparation to pilot them safely through the year. All teachers who can do so should attend the summer session in some good institution and pursue the course in agriculture best adapted to their needs.

It seems advisable, for the present and perhaps for

some years to come, that the courses in agriculture given at summer sessions should be of a rather general character. This does not necessarily mean that they need be exploitative courses; indeed, they should not be, and instructors will do well to provide against such a policy. The content training for the elementary school teacher, or the teacher of a rural or village high school where only a one-year course in agriculture is taught more as a cultural than a vocational subject, needs to be quite different from that for the person who is a prospective candidate for a department in an agricultural high school, for the department of agricultural education in a normal school or a teachers' college, for a department of an agricultural college, or for practical farming.

Specialists in the various fields of human endeavor seem slow to learn and quick to forget the general nature of the field in which the American school teacher is compelled to labor. The legitimate work of the elementary and high schools must necessarily be elementary and general, but fundamental. The average public school teacher needs a general view of the subject, a grounding in the fundamentals by the use of typical concrete materials necessary for definite and adequate illustration and practice. All nonessentials for the actual and immediate work of his particular sphere of teaching should be left out. Summer schools ought to meet such requirements by offering, (a) a course in elementary agriculture, (b) a course

in secondary agriculture, and (c) a course in agricultural teaching. The majority of teachers will have neither the time nor the inclination to give this single phase of their work more extended attention in the summer school. That is the only time when teachers in active service may attend institutions of learning to acquaint themselves with the new developments of their profession and to renew their acquaintance with the older subjects, which are quite as essential as the new ones. This must not be construed to mean that a more extended training than here recommended for the summer school would not be beneficial or advisable; it certainly is to be advised and commended, but this is a consideration for the person who is pursuing an extended college course during the regular college year, and cannot apply, except in rare cases, to the active teacher who is the patron of the summer school. Nor do we mean to suggest that a few of the more technical courses of the college of agriculture should not be offered for those persons who may desire to pursue an extended agricultural course by doing consecutive work therein summer after summer. These more comprehensive courses of the technical college have their place in the summer school, if they are pursued by those persons who have an aim similar to that under which such courses were constructed and are offered.

Note.—The following works on elementary and secondary agriculture are especially recommended for use as guides in home study:

Books for High School Teachers

Bailey, L. H.: *The Principles of Agriculture*, 1907, pp. 300. The Macmillan Company, New York.

Brooks, William P.: *Agriculture*, three volumes, 1905, pp. 856. The Home Correspondence School, Springfield, Mass.

Davis, Kary Cadmus: *Productive Farming*, 1911, pp. 357. J. B. Lippincott Company, Philadelphia.

Halligan, James Edward: *Fundamentals of Agriculture*, 1910, pp. 490. D. C. Heath and Company, Boston.

Jackson, C. R., and Daugherty, Mrs. L. S.: *Agriculture Through the Laboratory and School Garden*, 1908, pp. 450. Orange Judd Company, New York.

Kyle, Edwin Jackson, and Ellis, Alexander Caswell: *Fundamentals of Farming and Farm Life*, 1912, pp. 557. Charles Scribner's Sons, New York.

Mayne, D. D., and Hatch, K. L.: *High School Agriculture*, 1913, pp. 432. American Book Company, New York.

Warren, G. F.: *Elements of Agriculture*, 1910, pp. 434. The Macmillan Company, New York.

Books for Elementary School Teachers

Burkett, Charles William; Stevens, Frank Lincoln; and Hill, Daniel Harvey: *Agriculture for Beginners*, 1904, pp. 339. Ginn and Company, Boston.

Ferguson, A. M., and Lewis, L. L.: *Elementary Principles of Agriculture*, 1909, pp. 318. Ferguson Publishing Company, Sherman, Texas.

Fisher, Martin L., and Cotton, Fassett A.: *Agriculture for Common Schools*, 1909, pp. 381. Charles Scribner's Sons, New York.

Mann, Albert R.: *Beginnings in Agriculture*, 1911, pp. 317. The Macmillan Company, New York.

Nida, William L.: *Elementary Agriculture*, 1913, pp. 240. A. Flanagan Company, Chicago.

Nolan, Aretas W.: *One Hundred Lessons in Agriculture*, 1911, pp. 351. Row, Peterson and Company, Chicago.

Soule, Andrew M., and Turpin, Edna Henry: *Agriculture: Its*

Fundamental Principles, 1907, pp. 320. B. F. Johnson Publishing Company, Richmond, Va.

Stebbins, C. A.: *The Principles of Agriculture*, 1913, pp. 380. The Macmillan Company, New York.

Upham, A. A.: *An Introduction to Agriculture*, 1910, pp. 270. D. Appleton and Company, New York.

Wilkinson, John W.: *Practical Agriculture*, 1909, pp. 383. American Book Company, New York.

Wilson, A. D. and E. W.: *Agriculture for Young Folks*, 1910, pp. 340. Webb Publishing Company, St. Paul.

Wood, Milo N.: *School Agriculture*, 1912, pp. 329. Orange Judd Company, New York.

Pedagogical.—The following pedagogical books on agricultural education are also recommended:

Bricker, Garland Armor: *The Teaching of Agriculture in the High School*, 1911, pp. xxv+202. The Macmillan Company, New York. This book is devoted to the instructional phase of the subject.

Davis, Benjamin Marshall: *Agricultural Education in Public Schools*, 1912, pp. vi+159. The University of Chicago Press, Chicago. This is a study of the development of agricultural education, with particular reference to the agencies concerned.

Robison, Clarence Hall: *Agricultural Instruction in the Public High Schools of the United States*, 1911, pp. viii+205. Teachers College, Columbia University, New York. The administrative phases of the subject are discussed in this book.

5. Teachers' extension schools.[1]—The "Nelson Amendment" (34 Stat. L. 1281), approved March 4, 1907, and effective for the fiscal year ending June 30, 1908, provided for increasing, at the rate of $5,000 a year for five years, the funds appropriated by the Federal Government to the several states and territories

[1] The first complete account of these schools, was published in *The School Review*, Vol. XX, pp. 266–270, April, 1912.

for the support of the colleges of agriculture. A proviso in the act makes it permissible for the land-grant colleges to devote a part of this twenty-five-thousand dollar increase "for providing courses for the special preparation of instructors for teaching the elements of agriculture and the mechanic arts."

Until recently, the funds derived from this source were permitted to be used by the land-grant colleges on the campus only. On November 2, 1911, the Attorney-General of the United States promulgated the following rulings in reference to the use of the Nelson fund:

"No part of the funds received under the provisions of the acts of 1890 and 1907 may be used for any form of extension work, and all instruction must be given at the institutions receiving these funds, except that a reasonable portion of the funds provided by the act of 1907 may be used for the instruction of teachers in agriculture, mechanic arts, and domestic science in summer schools, teachers' institutes, and by correspondence, and in supervising and directing work in these subjects in high schools.

"All or a part of the funds provided by the act of March 4, 1907, may be used 'for providing courses for the special preparation of instructors for teaching the elements of agriculture and mechanic arts.' It is held that this language authorizes expenditures for instruction in the history of agriculture and industrial education, in methods of teaching agriculture, mechanic arts, and home economics, and also for special aid and supervision given to teachers actively engaged in teaching agriculture, mechanic arts, and home

economics in public schools. It does not authorize expenditures for general courses in pedagogy, psychology, history of education, and methods of teaching." [1]

In each state, therefore, there exists a financial means for carrying on teachers' extension schools in agriculture, domestic arts, and farm mechanics through the initiative of the land-grant colleges, if only the governing bodies of these institutions desire to apply a portion of the Nelson fund for that purpose.

During the school year 1911–1912, a plan for carrying on teachers' extension schools for the training of teachers engaged in active service in the elements of agriculture and the methods of teaching the same, was worked out experimentally under the auspices of the College of Education and Agriculture of the Ohio State University. A school was started at Circleville, Ohio, in connection with the bimonthly session of the Pickaway County Teachers' Institute, October 28th, 1911, for the purpose of instructing the teachers of Pickaway and adjoining counties in the elements of agriculture and the pedagogy of teaching the same. As soon as the rulings of the Attorney-General were made known, money from the Nelson fund was at once applied to help defray the expenses of this school. Doubtless this was the first school of its kind in the United States to use Nelson funds for the training of employed teachers. On January 13 and

[1] See pp. 11, 12, of the United States Bureau of Education bulletin of 1911 entitled *Federal Laws, Regulations and Rulings Affecting the Land-Grant Colleges of Agriculture and Mechanic Arts.*

20, 1912, similar schools were begun at Mt. Vernon and Van Wert, Ohio, respectively.

For the benefit of others who may wish to institute similar schools, a brief description of how to organize and manage them is here given.

The first step is the appointment of a local leader, known as the Chairman of the Executive Committee, who will with others, work to create sentiment for the proposed school, present the plan to the teachers at their meetings and elsewhere, and secure from them pledges of attendance. In the meantime brief articles on the nature and purposes of the school should be sent out to all the newspapers in the county where it is contemplated holding the proposed school. Invitations to become members of the school should also be sent to all the teachers of the county. The local leader may be furnished with pledge cards upon which to secure the names and addresses of the teachers who pledge attendance. When fifty such pledges are secured, the cards are filed with the college or university, and the teachers' extension school is granted to the county or community seeking it. The sessions should be held in the town most easily accessible to the majority of the teachers—usually the county seat.

A membership fee of twenty-five cents, payable at the first meeting, may be required of each member, and the sum thus realized used by the executive committee to defray the local expenses of the school. All other expenses—the salary of the instructor, and his rail-

road and hotel expenses—will be assumed by the university.

The complete organization of the school should be effected at the first meeting. Each school requires at least four officers besides the university professor who exercises general supervision over its instructional activities, and the chairman of the executive committee. These officers are: a secretary, a treasurer, a librarian, and a doorkeeper, who together with the chairman constitute the executive committee. The executive committee has general charge of the local business matters of the school.

A press committee is also usually appointed by the chairman of the executive committee. This committee furnishes brief reports to the local press concerning the instruction and the progress of the school.

The school should be divided into two classes, A and B. This division is made in order to reduce the number of books necessary for one school. There may be two sets of books, one set on the teaching of agriculture and the other on the content matter of agriculture. At the first meeting, references in the first set of books are assigned to class A, and references in the second set, to class B; at the second meeting, the sets of books together with the corresponding references are interchanged between the two classes. A new assignment of reading is made at the third, and thereafter at each odd-numbered meeting. The members of the school may or may not read the assignments.

Experience has shown, however, that in the majority of cases the reading is done. The members are given to understand from the outset, that each individual will derive benefit from the school in the direct ratio of his own efforts. Incidentally, the division into classes affords the basis for creating a healthy rivalry between them, which may often be used to good advantage.

The equipment of the school may be very simple. A room in which to meet regularly must be provided. Large schoolrooms and high school assembly rooms have been found very satisfactory for this purpose, especially where there are a sufficient number of individual desks upon which the notebooks, the agricultural materials, and the simple apparatus may be placed. The commodious blackboard of the schoolroom will also be a welcome feature. The agricultural materials should be brought to the school mostly by the teachers from the local farms. The simpler apparatus needed may be provided by the executive committee, while the more expensive should be brought from the university. In Ohio, the Traveling Library Department of the state library was especially courteous and helpful in furnishing a select list of textbooks for reference reading.

The sessions usually are held on Saturdays, there being two meetings to each session, one in the morning and one in the afternoon. The meetings may be an hour and a half to two hours long. They may be

held on consecutive or on alternate Saturdays, the latter plan being found the better. When the alternate-Saturday plan is used, one instructor may conduct two schools at the same time. These schools in Ohio continued for six sessions.

The aim should be to make the instruction so practical and definite that the teachers in attendance may use the materials and methods given them in their own schools during the two intervening weeks. That the teachers appreciate the opportunity thus afforded them will be seen from the fact that the enrollment in the first school, held at Circleville, was sixty-two, and several of the teachers attended the school at a personal expenditure of several dollars. At Mt. Vernon the enrollment was seventy-two on the first day, the rural teachers braving the severe cold of a morning when the mercury stood 15° below zero. The school at Van Wert enrolled eighty-eight on the first day. The total enrollments of these schools reached one hundred five and one hundred twenty, respectively.

The possibilities of the teachers' extension school are very great. By enlarging its scope through the presentation of additional subjects, it may well become a worthy successor to both the teachers' institute and the reading circle. By supplementing the available Nelson fund with the sums usually spent on the institute and the reading circle, a teachers' extension school might be carried forward on alternate

A LESSON ON THE COW AT A TEACHERS' INSTITUTE

A SUMMER-SCHOOL CLASS OF TEACHERS STUDYING THE PLOW

Saturdays throughout the greater portion of the school year. Again, it would be possible to reach the children in the public schools more effectively than is now done, with authentic information and approved methods of teaching. Through a school of this kind, attended regularly by fifty teachers, each of whom has twenty pupils, it is possible to reach one thousand children immediately and effectively. With a teachers' extension school in each county, from 50,000 to 100,000 public school pupils could be reached in each year in the larger states. This is an extremely rapid and effective means by which to spread the light of popular industrial education. The surprising thing is that a similar method of preparing teachers who are in active service was not long ago instituted.

The following scheme is suggested whereby any state may institute a system of teachers' extension schools. The county is taken as the unit.

One fourth as many schoolmen as there are counties in the state should be invited to attend the summer session of the land-grant college for the purpose of pursuing a course of instruction designed to prepare them for conducting teachers' extension schools. These persons should be leaders in rural school affairs and be interested in agricultural teaching. With these instructors in charge, and by the use of the alternate-Saturday plan, one half of the extension schools may be carried on in as many counties of the state from October to December, while the same number of schools

may be carried on by the same force of instructors in the remaining counties of the state after the holidays, from January to March. Since the sessions would be held on Saturdays, the schoolmen in charge could do this work in addition to their regular employment.

By way of remuneration for the time spent in preparation at the summer session, and for the actual work of instruction, these extension school instructors should be paid a sum of $10.00 to $15.00 a week for their services, they paying their own necessary expenses—railroad fares and hotel bills—from this sum. The local, incidental expenses of the school may be paid from the fund realized from the small registration fee of twenty-five cents, required from each member. The money for paying the salaries of the instructors would, of course, be appropriated by the land-grant college from the Nelson fund. The whole system of teachers' extension schools would be under the direction and supervision of the department of agricultural education located at the college.

The cost of such a system of schools, using Ohio as an example, with a force of twenty-two instructors, each school being run for twelve weeks on alternate Saturdays, and each instructor being paid the sum of twelve dollars a Saturday, would be $6,336. If a fifty-volume library of suitable books for reference reading were provided for each school, an additional sum of about $2,000 would be required. This is a total sum of $8,336; or, if 90,000 children were reached—

which would be a much smaller number than would result by using in our calculations the average reached by the three trial schools—less than 9 cents per capita. In addition to this over 5,000 teachers would receive some genuine, practical training and no small amount of enthusiasm, both of which would add a wonderful impetus to the educational endeavor in rural communities. In this day, when popular education is coming to be considered a serious economic problem, the plan set forth in this section ought to arrest the attention of those interested in state as well as in educational affairs.

6. Normal school and college courses.—The agencies we have named are designed to meet the needs of employed teachers. They are expedients to supply the necessary information and help to teachers who have not hitherto had the opportunity of securing a more or less adequate training for the task of teaching agriculture. It becomes more imperative year by year that teachers of agriculture prepare themselves most thoroughly for their work. To this end they should seek to pursue and complete appropriate courses in agricultural education or agricultural teaching at those educational institutions best prepared to serve the teaching profession in this respect.

There are four factors that influence the organization of courses in agricultural education: (a) the technical, (b) the professional, (c) the general training courses that are more or less contributory to the effi-

ciency of the agricultural teacher, and (d) the administrative, including economy.

(a) **Technical training.**—The technical training that a teacher of agriculture may be expected to attain will depend upon the kind of school in which he intends to teach, whether in an elementary school, a general [1] high school, a normal school, a general[1] college, an agricultural high school, or an agricultural college. As a fundamental, working principle, it may be stated that the technical training of all such teachers should begin the same and become accumulative in the order in which the schools in the foregoing list are mentioned.

Laboratory and field work, including the organizing and operating of a demonstration field and home projects, should be provided for. A course of this character gives the proper perspective to the various departments of agricultural science and art and constitutes an indispensable basis for the special application of the principles of pedagogy to agricultural teaching, besides making an excellent foundation upon which to build a specialized study in any of the various departments of agriculture. The acquisition of this training should be accomplished by pursuing a course in the *elements of general agriculture*, which should represent at least one fourth of one year's study.

A course of technical agriculture, like that outlined

[1] The word " general " as here used has reference to the academic, non-technical schools.

in the preceding paragraph, is deemed sufficient also for the teachers in the general, non-technical high schools where only short courses are offered, and where this science is taught mainly as a cultural subject.

Teachers for general departments of agriculture in normal schools, general non-technical colleges, and agricultural high schools not organized on the departmental plan, should, in addition to the foregoing, pursue the introductory, fundamental courses in each of the departments usually found in the agricultural colleges, which should represent full time work for about one and one half years.

Teachers preparing to teach in technical, agricultural high schools organized on the departmental plan, and in agricultural colleges, should pursue specialized studies in those particular departments in which they expect to become teachers, an additional period representing an additional one half year and one full year, respectively.

(b) **Professional training.**—The general professional training of all teachers of agriculture will be much the same and should consist of one half to one year's course in *educational psychology*, and at least one half year in *general methods*. The special training will be determined by the kind of school in which the teacher in training expects to serve. There should be at least one half year in special methods for all teachers: *teaching elementary agriculture* for teachers in the elementary school and *teaching high school agriculture*

for the teachers in the secondary schools. From one fourth to one half of the time in these two courses should be spent in *practice teaching* in corresponding rural schools.

If the student is to become a teacher in a normal school or in a department of some other higher institution, where superintendents and supervisors are to be trained, there should be required at least a half year course in the *administration of agricultural teaching* in addition to the strictly pedagogical requirements.

(c) **Contributory general training.**—The training of teachers of agriculture may not properly be limited to the technical subjects. There are other subjects that contribute to the efficiency of agricultural teaching. In fact, it is essential that teachers of agriculture should have a grounding in general science,—especially in chemistry and physics, economic botany and zoölogy, while some knowledge of elementary geology (or physical geography) is helpful. Rural economics and rural sociology are especially mentioned in order that their importance in the training of teachers of agriculture may not be overlooked. Teachers for the high schools, the normal schools, and the colleges of whatever type should pursue at least the general, or foundation, college course in each of these subjects. These non-technical but contributory subjects will represent about one full year's study.

Summary of training.—The following summary of the

technical and the professional training of each of the various classes of teachers will be of interest:

For Teachers of Agriculture in Rural and Village Elementary Schools

Technical Training	Hours
The Elements of General Agriculture	8
Professional Training	
Educational Psychology	3
General Methods	3
Teaching Elementary Agriculture—Special Method	2
Practice Teaching	2
Contributory General Training	
Rural Economics	2
Rural Sociology	2

Secondary courses in Physics and Chemistry, Economic Botany and Zoölogy (or Biology), Physical Geography (or Elementary Geology).

Total collegiate hours 22

For Teachers of Agriculture in Rural and Village High Schools

(Schools offering 1 or ½ unit) [1]

Technical Training	Hours
The Elements of General Agriculture	8

[1] A "unit" is defined as "a course of study covering a school year, which shall include in the aggregate not less than one hundred and twenty sixty-minute hours of classroom work, two hours of manual training or laboratory work being equivalent to one hour of classroom work."

Professional Training	Hours
Educational Psychology	3
General Methods	3
Teaching High School Agriculture—Special Method	2
Practice Teaching	2

Contributory General Training	
Rural Economics	2
Rural Sociology	2
General or foundation normal school or collegiate courses in Physics and Chemistry, Economic Botany and Zoölogy (or Biology), and Physical Geography (or Elementary Geology), totaling about	40
Total hours	62

For Instructors of Agriculture in Normal Schools

Technical Training	
The Elements of General Agriculture	8
Elements of Horticulture	8
Elementary Farm Crops	8
Elements of Animal Husbandry and Dairying	12
General Farm Management	4
Farm Machinery and Engineering	4
Elementary Soils	8

Professional Training	
Educational Psychology	3
General Methods	3
Teaching Elementary Agriculture—Theory	2
Practice Teaching	2

Professional Training (continued)	Hours
Teaching High School Agriculture—Theory	2
Practice Teaching	2
Administration of Agricultural Teaching	2
Contributory General Training	
Same as for High School Teachers	40
Total hours	108

For the General College and Agricultural High Schools not Organized into Departments

In general, the training of the instructors in these two classes of schools should be the same as that of the professor of agricultural education in the normal school, except that the course in *administration of agricultural teaching* might well be eliminated.

For Agricultural High Schools (Departmental) and Agricultural Colleges

The prospective instructor in any given department of an agricultural high school organized on the departmental plan should receive about sixteen hours additional instruction in the technical subjects of his special field; while he who has in view teaching in a department of an agricultural college should have not less than 32 hours of such additional instruction. Measuring the training in hours,[1] we have, for each,

[1] An hour is defined as a sixty-minute period of classroom work a week, through a semester, either in lecture or recitation; two such periods of practical laboratory, or field work being regarded as the equivalent of one period of classroom exercise.

124 hours and 140 hours, respectively. It will be noticed that no consideration has been given to courses in English, public speaking, the languages, mathematics, history, etc. The training of teachers of agriculture should not omit an acquaintance with any of these departments of culture, for such teachers should be as broadly educated as other members of the faculty. Adequate training in English and in public speaking is quite essential for those persons who are preparing to do local extension work in agriculture. Since the special training set forth above, will require four years to complete, it will be seen that about one year's graduate study is necessary to equip the agricultural college man under present conditions. Indeed, it is probable that the best agricultural colleges will soon insist that the younger members of their faculties shall have a doctor's degree.

(d) **Administration.**—The administrative factor of the college cannot be overlooked. Many of these courses are offered in the regular agricultural college curriculum, and should be pursued under the professors and in the departments offering them. No additional organization will be needed. Where there is a school of education in the same institution, the strictly educational work may be similarly disposed of.

The program of studies above outlined is one which very few, if any, of our agricultural colleges offer in its entirety. Since this is true, there should be a distinct department to offer those subjects for the

training of teachers that may not well be included in departments already established. On the other hand, there is need for the unification and classification of the very diverse materials into workable systems, not for farm practice but for teaching purposes. Because there is a difference of aims in the training of farmers and of teachers, there must be a difference in the courses for the attainment of these aims. The divergence of the courses to be traversed by these two classes will be in ratio to the divergency of the ends in view. The curriculum for the agricultural teacher is a sort of shunt from the main line after having traveled with it during a large part of its course, and after separation, still runs paralled with it.

It all means exactly this: that there is a difference between farmer training and teacher training; that to secure the greatest efficiency in the teaching of agriculture, this difference must be recognized and provided for; that there must be departments in our agricultural colleges, in charge of specialists of agricultural teaching; that these departments should avail themselves of all courses possible for them to use in the training of the various grades of agricultural teachers and supervisors of agricultural teaching; that they should institute and offer new or special courses needed. This implies a distinct program of studies, but not wholly a new set of courses. To administer such special training there will be need of a distinct department with a faculty of one or more persons, depending

upon the extent and degree of efficiency to which the work of teacher training is carried, and the encouragement that this new department of agricultural education, or agricultural teaching, receives.

Review of Chapter VI

Name the four agencies first considered in this chapter. What is said of home study? How may teachers' institutes assist in the preparation of teachers to teach agriculture? Show how superintendents and supervisors may give assistance. To what extent are summer sessions recommended? What courses are recommended for teachers in summer sessions and why?

What do you remember concerning—

The Nelson Amendment—its origin and purpose? The first Nelson teachers' extension school? The first step to be taken in the organization of a teachers' extension school? The complete organization of a teachers' extension school? The advantage of dividing the members of the school into two classes? The necessary equipment for conducting a teachers' extension school? The days and the frequency of the sessions of the school? The aim of the instruction given? The possibilities of teachers' extension schools? The scheme for inaugurating a state-wide system of teachers' extension schools?

What can you say in support of—

Thorough professional training for teachers of agriculture? The technical training proposed for each of the following classes of teachers: elementary school; general, non-technical high school; normal school, and general non-technical college; agricultural high school, and agricultural

college? The professional training proposed for the various classes of teachers named? A "contributory general training"? To what extent should this be carried? The training suggested for professors in agricultural colleges? The administrative problems involved in the method of training teachers in the higher institutions? Separate departments of agricultural education in normal schools and agricultural colleges?

CHAPTER VII

ELEMENTARY AGRICULTURE AND NATURE STUDY

I. Introduction

Nature study preceded elementary agriculture as a subject of study in the public elementary schools. The enthusiasm for nature study reached its height during the last decade of the nineteenth century and the first decade of the twentieth. It was during this score of years that the best books on nature study were written, that the various organizations to promote and unify the subject were born, and that the official organ of the American Nature Study Society, the *Nature-Study Review*, was founded. During this period, too, various principles and methods for the study and teaching of nature study were enthusiastically promulgated. Consequently writings on this subject have been numerous, and persons interested in this phase of educational endeavor have found it comparatively easy to supply themselves with good reading matter on nature-study subjects.

To the impartial observer, however, there is unmistakable evidence that the enthusiasm which has in

past years characterized the nature-study movement is on the wane.[1] We no longer find the same abundance of fresh literature on the subject; perhaps the field has been thoroughly covered. Nature study is not so prominently a part of educational discussions now as it was only a few years ago; perhaps teachers have learned to teach the subject more efficiently, and the passing of the novelty and the stage of exploitation has gradually allowed it to sink to the commonplace—to a level with the older subjects of the elementary school. No new philosophy of nature study has been proposed or expounded recently; perhaps the right one has been discovered, or every individual finds that one corresponding to his own views has already been formulated which satisfies his needs. However these things may be, one must admit that the nature-study idea does not to-day command the prestige and attention in the educational world that it promised only a few years ago.

Yet, nature study has won a permanent place in the elementary school. It has a very necessary function in the modern education of the child. It is a generic study, and although it is not a science, no science can ever take its place. As long as it is a useful study, and an efficient method in the process of educating the child, and as long as the child's nature remains the same as it now is, nature study will be

[1] *Education* (Boston), Vol. 29, p. 291. *Elementary School Teacher* (Chicago), Vol. II, p. 452.

used in the schools to secure the desired adjustment of the child to his environment.

Elementary agriculture began to be taught in the public elementary schools during the first decade of the present century. In fact, the first elementary agriculture taught in the schools was under the cloak of nature study. Since nature study incorporates in its possible sphere all natural objects and phenomena, domestic animals and plants as well as soil and other objects of the farm and agricultural phenomena are recognized as legitimate and desirable objects of study. The advocates of the so-called practical education were quick to see this vantage point, and those who were in position to lead, insistently urged the use of farm materials and agricultural phenomena.[1] A large amount of literature in harmony with this idea began to be supplied to teachers. About the same time, the philosophy of the economic aim in nature study came to be the dominant guide in the selection of materials for study.[2] It thus came about that the subjects of nature study were, in large measure, selected from among the objects and phenomena with which agriculture deals, instead of from the undomesticated plants and animals and uneconomic things, as at first.

[1] The achievements of Dean L. H. Bailey in this respect are especially noteworthy. See *The Rural Educator* (Columbus, Ohio), Vol. I, p. 65.

[2] See especially, pp. 1 and 2 in *Nature Study and Life* by Clifton F. Hodge. Ginn and Company, Boston, 1902.

KINDERGARTNERS AT WORK

A DEMONSTRATION FIELD ONE MONTH AFTER PLANTING

This remarkable line of development of nature study gave rise to many confusing notions in regard to elementary agriculture and nature study. It was, for a time, difficult to differentiate them. Indeed, there were those who even went so far as to assert that in essence nature study and elementary agriculture are one and the same thing, that a difference in name does not necessarily imply a difference in content and method, and that the aims of one are practically the same as the aims of the other. But it was easily pointed out that nature study includes many things not related to agriculture or at best very remotely so. To designate that nature study which is based on agricultural things, the term *agricultural nature study* came into use, and this may be regarded as the first step in the effort to differentiate elementary agriculture from the general subject of nature study. However, in different sections of the country elementary agriculture continues to be taught as nature study, while elsewhere nature study is taught under the name of elementary agriculture.[1]

It will thus be seen that any discussion of elementary agriculture is closely wrapped up with a discussion of nature study also. The differentiation of these fields of learning is not clearly defined in the popular mind even to-day, and many teachers need assistance in making a clearer definition of the sub-

[1] Cf. Coulter and Patterson's *Practical Nature Study*, pp. 1–2. D. Appleton and Company, New York, 1909.

jects. To make the differentiation adequate is the object of this and the following chapter.

II. What is Nature Study?

Nature study is not a fashionable pastime for both pupils and teacher. A clear definition of nature study and an adequate statement of its purpose have been long in coming, and perhaps have not yet arrived. There is a great deal of talk about nature study by persons who have only the haziest idea of what they mean by it. We find statements of its purpose ranging all the way from the cultivation of a sentimental love for nature to training in habits of exact observation and inference. This last purpose has been carried to such an extent that many educators designate the study by the term *elementary science.* But nature study is not a science in the sense that there is any given body of systematically arranged facts, principles, and laws to be learned; yet it is more than a mere sentiment—a love of nature. Nature study finds its place between these extreme views.[1]

There are two points of view from which nature study is considered by various writers and philosophers. Some consider the child and the *purpose* of teaching him (philosophers); others consider the *materials* used in the teaching process (scientists). No adequate

[1] *Science*, Vol. 30, p. 525. Coulter and Patterson: *Practical Nature Study*, pp. 16–17. Scott, Charles B.: *Nature Study and the Child*, 1902, Chap. III. D. C. Heath & Co., Boston.

or intelligent notion of nature study can be secured without making this distinction.[1]

III. Nature Study as a Purpose

Considered as a purpose, *nature study* is a misnomer, and does not mean, primarily, a subject of study, but a philosophy in education, a point of view, an attitude, a purpose. It is spirit, not subject matter. Things are taught for the sake of the child rather than to promulgate knowledge. From this point of view, things and phenomena are studied merely incidentally as means to ends. The intention is to broaden the horizon, the outlook, the experience of the child. Pencil and paper will not be needed; only the senses and the mind processes. Facts, truths, feelings, ideals, and convictions will be registered on the tablets of the heart.[2]

"Consider the end," says the philosopher in reference to the purpose for which the child is brought into contact with nature materials or phenomena. Thus, various aims have been enunciated as desirable goals to be realized through child development by the teaching of nature study. Various philosophies of the present and the past have caused constant shifting in the point of view and consequently in the aims of nature

[1] In this connection, the reader is referred to an interesting article written by C. F. Hodge in *The Pedagogical Seminary*, Vol. 7, pp. 208–228, entitled *Foundations of Nature Study*, wherein he discusses various methods in teaching nature study.

[2] Bailey, L. H.: *The Nature-Study Idea*, 1909, pp. 6, 13–14, 30.

study. Among the most prominent, the following aims may be named: the religious, the ethical, the mental-discipline, the sentimental, the æsthetic, the cultural, the knowledge, the utility, and the scientific-method.

The religious aim [1] was perhaps the first one to be accepted—historically considered—as the true purpose to be realized in child development through nature study. Doubtless this purpose comes to us from Puritan times, when the study and teaching of temporal things were permitted only on the plea that they contributed to the religious instincts of the child. All other aims were considered subordinate to this one. The study of nature was considered to have missed its highest purpose unless it led the child from nature to the Author of nature. Unless the seen pointed the child to the Unseen, from care and protection to a Protector, from function and action to a Prime Mover, from purpose and plan to a Planner,—nature did not reveal its greatest thought or grandest lesson of omniscient law and eternal unity. So through nature study, God revealed his wonderful works to the children of men. The high regard in which astronomy was once held in popular education doubtless owed

[1] Scott's *Nature Study and the Child*, pp. 37, 116, 118. Hodge, Clifton F.: *Nature Study and Life*, p. 30. Foght, Harold Waldstein: *The Rural School of the Twentieth Century*, p. 160. McMurray, Chas. A.: *Special Method in Elementary Science*, p. 8. Ira Benton Meyers in *The Elementary School Teacher*, Vol. XI, p. 209.

its popularity to this notion. It is, without doubt, true that the fundamental sentiments on which the highest religion rests are best developed in children by the use of the noblest objects in nature.

The ethical aim [1] is closely associated with the religious aim and doubtless followed it historically. The admiration of the wonders of creation that resulted in love and obedience to the Creator was maintained to have a desirable reaction upon the conduct of the child in his relations with his fellows. The humanitarian element would be awakened, especially through experience with animal life. Sympathy and affection for pets would induce the child to be kind and gentle in his attitude toward animal life generally, and any disposition to kill or injure would be overcome.

The mental-discipline aim [2] came next and held sway during the time when the formal-discipline theory held a dominant place in the educational world. Since the sciences, as botany, chemistry, and physics, were regarded as having high "disciplinary value," of course, nature study, or elementary science, which

[1] See Ira Benton Meyers in *The Elementary School Teacher*, Vol. VI, p. 260. Hodge's *Nature Study and Life*, pp. 28–30. Schmucker, Samuel Christian: *The Study of Nature*, pp. 41–44. J. B. Lippincott Co., Philadelphia, 1908. Holtz, Frederick L.: *Nature Study*, 1908, pp. 18–20, also Chap. III. Jackman, Wilbur S.: *Nature Study*, 1894, p. 4. Henry Holt and Company, New York.

[2] Meyers, I. B., in *The Elementary School Teacher*, XI, p. 212. Newman, Ibid., p. 193. Holtz, Frederick: *Nature Study*, 1908, pp. 12–13. Charles Scribner's Sons, New York.

dealt with the same materials as these sciences, was also considered to have a high disciplinary value.

The sentimental aim [1] is reached when the child, through the study of nature materials, comes into possession of a nature-sympathy, a love, a prejudice in favor of his natural environments. This sympathetic attitude toward nature enhances the joy of living.

The æsthetic aim [2] leads children to see and feel the beautiful in nature to the end that life may become more joyful. "The psychological genesis of a genuine love of nature is the crowning result of nature study," says one author.

The cultural aim results from the fact that the objects constituting the materials of nature study may be widely chosen—from any natural environment—and the natural environment is quite universal. To a great degree, common knowledge and experience and reactions come into the possession of a vast majority of the members of the race. This common knowledge of nature that all men should possess stands for a given kind of culture, which nature study enhances.

The observational aim.[3]—The cultivation of the habit of observing closely and accurately is held by

[1] Bailey, L. H.: *The Nature-Study Idea*, 1909, pp. 5, 28.

[2] Holtz's *Nature Study*, pp. 14–16, Chapter III.

[3] See Hugo Newman in *The Elementary School Teacher*, Vol. 6, p. 192. Mrs. L. L. Wilson: *Nature Study in Elementary Schools*, p. 4 (adverse). Holtz's *Nature Study*, pp. 8–9. Chas. A. McMurray's *Special Method in Elementary Science*, p. 7.

many to be the chief aim of nature study. Others hold that the acquiring of knowledge about one's natural surroundings constitutes its chief aim and may be designated as the **knowledge aim.** Still others qualify the knowledge aim and insist that it must possess a utilitarian value, that, when exercised by the possessor, it may yield economic results; and this may be designated as the **economic aim.** Finally, we have the **scientific-method aim** in which the study of Nature in her innumerable forms and manifestations develops in the child the inquiring spirit for fact and truth. When these are discovered, they should be methodically classified into systems.[1]

The four aims mentioned and explained in the foregoing paragraph are not usually accepted by the philosophic school, who insist that these are only means to higher ends—as being only rungs in the golden ladder by which the spirit-heaven of nature is reached, i. e., the attainment of one or more of the various aims above considered.[2] While these various aims doubtless contribute to the development of desirable qualities in the child, they may be regarded merely as means

[1] Holtz's *Nature Study*, p. 6. Hodge's *Nature Study and Life*, pp. 2–18. McMurray's *Special Method in Elementary Science*, pp. 8–18.

[2] Mrs. L. L. Wilson: *Nature Study in Elementary Schools*, p. 4. Bailey's *The Nature-Study Idea*, pp. 31–32. McMurray's *Special Method in Elementary Science*, p. 18. A good statement of aims in nature study will be found in Scott's *Nature Study and the Child*, Chap. IV.

to other ends. They seem to regard the materials of study rather than the child: the child is developed, not for his own inherent sake, but that he may become more capable of making investigations in the higher forms of science.

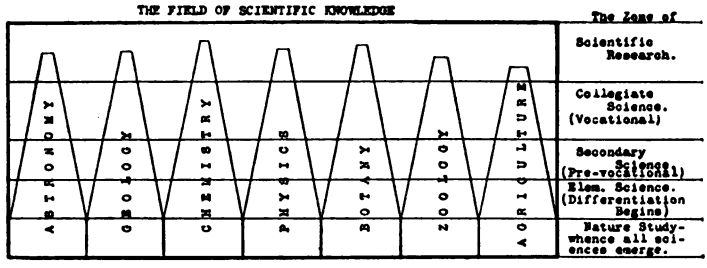
IV. Nature Study as Science

Those who place emphasis upon the methodical arrangement of the materials of study in nature study are apt to consider the whole subject as elementary science. In some cases these persons have succeeded in building up what they consider a methodical arrangement of subjects pertaining to nature to be systematically pursued through the various grades of the elementary school.[1]

It should be noticed that this school of nature-study people does not regard the subject as *a science*, but as *elementary science*. The term is used in a general sense. It considers the commonest, most evident facts and principles of the natural world, no matter where they are manifested, or in what particular field of science they may be classified. The study of nature coincides in part with all the sciences, but with none of them wholly.

The following diagram represents the field of nature study in its relations to the various sciences:

[1] See Otis W. Caldwell in *Natural History in the Grades, The Elementary School Teacher*, Vol. 10, p. 131 (adverse).



The materials for study may be drawn from the fields of any or all the natural sciences. Its field is the whole physical environment—the whole world of nature.[1] It partakes of the beginnings of many sciences. Thus nature study may include materials and phenomena that are agricultural, or that are classed in any of the other great natural sciences, as botany, zoölogy, astronomy, chemistry, physics, geology, etc. Nature study because of its relations to them may be made a valuable course in the first steps of many of the physical sciences. It is from this relationship that we doubtless get the term *elementary science* as a synonym of nature study.

"The relations of nature study to elementary agriculture is a study of nature's material in its natural setting. It is a many-sided subject, involving various phases of education among which agriculture deserves prominence. Strictly speaking, nature study is not

[1] Jackman's *Nature Study*, pp. 8–9, 29–438. Comstock, Anna Botsford: *Handbook of Nature Study*, pp. 938, 1911. Comstock Publishing Company, Ithaca, N. Y.

agriculture, but this does not prevent it from being of great value for agricultural purposes. Teachers who confine the work largely to agricultural material incorporate an economic factor which results in the work becoming a forerunner to and a part of agriculture." [1]

Review of Chapter VII

Concerning elementary agriculture and nature study—

Which was first taught in the public schools? What is the present status of each as a school subject? Show how elementary agriculture came to be taught as nature study. What is meant by "agricultural nature study"? What is nature study? Explain nature study as a purpose. Name and discuss the leading aims of nature study. Explain nature study as a science. Locate the zone of each in the field of knowledge. Explain the relations of nature study and elementary agriculture.

[1] S. A. Minear in *Nature Study*, Aug., 1912. Oklahoma A. & M. College, Stillwater.

CHAPTER VIII

WHAT IS ELEMENTARY AGRICULTURE?

An analogy [1] may assist in the better understanding of elementary agriculture, its field, its purpose, and its contents. In mathematics, we teach numbers to the beginner in the first grades of the elementary school. Later on, when the child has learned to count, to identify the symbols of numbers and their names, we gradually introduce him to the processes of addition, subtraction, multiplication, and division. Here we are teaching the fundamentals of a great science—mathematics. When these fundamentals of arithmetic have been mastered, the child is taught their wider applications in the grammar school.

The number stage in arithmetic represents the nature-study period in agriculture, and we may designate this work in the lower grades of the elementary school by the term agricultural nature study. Later on, the simple, elemental objects, facts, principles, and processes of agriculture are studied. We may call this elementary agriculture. In the high school the study of agriculture as a science, an art, and a business is

[1] See Dr. A. C. True in *Addresses and Proceedings of the National Education Association for 1908*, p. 1204.

undertaken in a more comprehensive and serious way, and this is designated as secondary agriculture.

The simple number work in the primary grades may not properly be called arithmetic; neither may the nature-study work with agricultural objects of the lower grades of the elementary school be properly regarded as elementary agriculture; it is rightly called agricultural nature study. As number work forms an indispensable basis for later work in elementary arithmetic, so agricultural nature study performs a similar duty to elementary agriculture. Number work should be differentiated from the technical science of arithmetic, and the same may be said of nature study in reference to agriculture.

The materials for study in elementary agriculture are the common, everyday things with which the children living on farms and in villages are acquainted. Some of these things are: the proper time for planting and harvesting crops; the appearance of various seeds, fruits, plants, and animals in their various stages of development; the different kinds of soil; the use of manure; the uses and the structure of the common agricultural implements, etc.[1]

More than a sympathetic acquaintance with these things will be developed in the elementary study of agriculture, because the child is now undertaking the study of a science. Not only should the names,

[1] See the author's *The Teaching of Agriculture in the High School*, pp. 2–5.

uses, striking characteristics, morphology, and habits of the physical and the biological objects of the farm and their economic importance to man be observed, but a system of elementary facts, principles, and laws should be built up in the mind of the child. The spirit of inquiry for reasons should be encouraged, and, from the results of investigations for the "why," elemental deductions should be made, and these impressed upon the student as being fundamental to agriculture.

The *how* as well as the *why* should receive consideration in elementary agriculture, for agriculture is an art as well as a science. Here belong the school garden and the simple home projects. The processes and methods of farm and garden work and its management must be taught by insisting upon the actual performance by the pupils themselves. The theory is learned by study, by explanation, and by demonstration; but the practice may be learned only by actual doing. The method is no longer observational as in nature study, but industrial. Ability to execute and the formation of habits are realized in the individual pupils by their performing physical acts; and when these are done in obedience to instruction, better understanding of the principles involved will invariably result.

But agriculture is not only a science and an art; it is also a business, and therefore economic. Of this phase elementary agriculture must also take cognizance. Industry and knowledge applied together on

the farm must result economically. To this end, pupils in the elementary school should be given home projects, the success of which should be measured in terms of profit.

The method of teaching nature study is observational; that of elementary agriculture is industrial and scientific. Agriculture is predominantly a utilitarian subject, and utility should be emphasized in the methods employed in teaching it. The aim of teaching nature study is to afford an acquaintance with, and an interest in, the common things of nature; but elementary agriculture adds to this an economic aim as its predominating purpose. Nature study differentiates from technical science; but elementary agriculture consciously and definitely teaches the beginnings of a science. Nature study should be taught for the child; but elementary agriculture should be taught for the adult into which the child will eventually develop.[1] As Dean Davenport puts it: "Agriculture, even in the grades, is something more than ordinary nature study. It is nature study plus utility. It is nature study with an economic significance. It is nature study which articulates with the affairs of real men in real life. It is nature study in which the child may influence the process. It is nature study which distinctly stimulates industry." [2]

[1] See A. W. Nolan in *The Rural Educator*, Vol. III, p. 8.

[2] Davenport, E.: *Education for Efficiency*, p. 139. Heath, Boston, 1909. Chapter VIII.

Elementary agriculture is not a catchall for all sorts of subjects. The tendency in some quarters for administrators, supervisors, and teachers to include under "elementary agriculture" all sorts of subjects foreign to the study, as domestic science, morals and manners, physiology, etc., cannot be too severely condemned.

Agriculture is the science, art, and business of producing the largest quantity and best quality of raw materials for food, clothing, shelter, and the æsthetic enjoyment of man, from the smallest area of land through the least expenditure of money, effort, and deterioration of the soil. Elementary agriculture strives, in a small way, to realize this ideal with beginners. Their faces should be set in this direction, which is a goal to be attained after many years of study and practice. **Elementary agriculture** is the study and practice of some of the simpler elementary scientific principles of agriculture.

Review of Chapter VIII

Give the author's view on—

The analogy existing between school agriculture and arithmetic. The materials for study in elementary agriculture. Emphasizing the *how* and the *why*. The threefold nature of agriculture. The differentiation of methods in teaching elementary agriculture and nature study. The things to be included and taught under the term, "elementary agriculture." The definition of agriculture.

CHAPTER IX

AGRICULTURE AS A MEANS OF EDUCATION

THAT the subject of agriculture, properly taught, is an efficient means to employ in the formal education of the youth is now coming to be generally recognized. It has long been suspected, and in recent years it has been urged by prominent educators, that agricultural materials may be employed in the education of school children quite as advantageously as those of any other subject. The inadequacy of agriculture as a science can no longer be urged against its being taught in the public schools. If it is still maintained that the constituents of physical and biological sciences may be used to contribute valuable elements toward the education of our children, then agriculture, which is both physical and biological, offers a double reason for seeking and maintaining a place in the program of studies.

Agriculture as a desirable subject for public school instruction offers a double sanction from another point of view: it may be both vocational and cultural. A double purpose may be served: through education in agriculture a utilitarian purpose may be reached in the production of a scientific farmer; on the other hand the impartation of ideas and ideals of beauty,

of sympathy, of ethics, and of service by means of this subject may result in an individual possessing a high type of culture. There is no good reason why the vocational and the cultural aims may not both be realized in the same individual. It is not the function of education in agriculture to produce more hogs and corn per acre at a greater profit with the least expenditure of energy and the minimum diminution of soil fertility only; but to educate men and women to live more efficiently both as individuals and as social units. Taught as a strictly vocational subject, agriculture contributes to the economic efficiency of the individual, while taught as a liberal subject, it ministers to his social efficiency.[1]

The educational value of agriculture as a fit subject for purposes of formal school instruction ought to be determined by the same pedagogical standards that are applied to those subjects now generally used in such instruction. The subjects that are now sanctioned by most educators are such as directly contribute to the realization of the accepted aim or aims of education, or as may be indirectly used as a means to these aims. In order to show the relationship that the subject of agriculture may bear to the final results of the educative process, it is merely necessary

[1] See W. H. Jordan in "The Function and Efficiency of the Agricultural College," *Science*, Vol. XXXIV, p. 785; and especially D. J. Crosby in the *Journal of Proceedings and Addresses of the N. E. A.* for 1910, p. 1105.

to show how the subject may be made to contribute to the various aims or ends of education. If agriculture may be made a potent factor in the process of realizing the aims or ends of education, either directly or indirectly, then there can be no legitimate reason why it should not be used in the formal instruction of the children in our schools.

The aims of education are various, according to the point of view of many philosophers and educators. A catalogue of all the aims of education that have been advanced by philosophers and educators with the briefest consideration of each would be not only out of place here, but wholly unnecessary. For our purpose, only a few of the most important as advocated to-day by philosophers, educators, and the popular mind, will be considered. The most important of these are: the aims of earning a livelihood, of gaining knowledge, of developing the mind, of complete and harmonious development, of refinement, of culture, of ethical training, of individual adjustment, and of social service.[1]

(a) **The livelihood aim.**—The aim of earning a living, sometimes designated "the bread-and-butter aim," appeals with especial force to the poor, to those people

[1] For a discussion of these various aims of education see the following references: Bagley, W. C.: *The Educative Process*, Chapter III. O'Shea, M. V.: *Education as Adjustment*, pp. 57–98. Raymont, T.: *The Meaning of Education*, Chapter I. Thorndike, Edward L.: *Education*, Chapters II and III. Henderson, Ernest Norton: *A Textbook in the Principles of Education*, Chapter I. Ruediger, William Carl: *The Principles of Education*, Chapters III, IV, and V.

who are possessed with only a moderate amount of wealth, to the practical man of affairs, and to the rank and file of the common people. With these classes, the economic problem of existence is a very important one. Their greatest wealth is in the personal power of the individual—power or ability to earn a living. The schooling of their children, they say, should fit them to get on in the world.

To the people who hold this aim as the end of education, the subject of agriculture as a means to this end should be especially attractive. Applied agriculture is essentially productive. Granted the necessary soil, the young man provided with a training in the science and practice of agriculture is able to earn a living by the most fundamental occupation. The farmer is best able to provide for himself the primitive necessities of food, clothing, and shelter.

(b) **The knowledge aim.**—The aim of acquiring knowledge as an end in itself has been called the schoolmaster's aim. "Knowledge is power," and those who, by habit and occupation, are engaged in gaining knowledge and in teaching others are apt to regard its acquisition as an end in itself without regard to the deeper and more significant meaning of their motto.

What a wealth of knowledge—facts, principles, laws, practice—agriculture offers for the realization of this aim! A lifetime of reading, study, observation, and experimentation will not encompass all there is to be known in this science and art.

(c) **The mind-development aim.**—The most striking difference between the educated and the uneducated individual is the superior ability of the former to think and understand. The popular mind has always recognized this. Hence, the "development of the mind" has come to be accepted as an end of education. The acquisition of knowledge, power of expression, and interpreting skill are concomitant and fundamental to this aim.

Much in the same way that agriculture may serve the knowledge aim, might it also serve the mind-development aim. As long as the almost inexhaustible subject of agriculture presents new things to be learned, the individual may continue to whet and expand his intellect.

(d) **Complete and harmonious development.**—This aim of education goes further than the one immediately above, because it insists upon the complete and symmetrical development of all the powers of man, physical, mental, and moral. This is the aim of education as set forth by Plato. It seeks to "give to the body and the soul all the beauty and all the perfection of which they are capable." Thus only may a human being be prepared for complete living.

If this be held as the true aim and end of education, then most certainly should the youth be taught agriculture; otherwise, he will be unsymmetrically and incompletely developed. On the other hand, since agriculture is so varied that it touches almost all

phases of life, and since it is so great that it is quite inexhaustible in educative materials and possibilities of experience, no other subject offers greater opportunities for the complete and harmonious development of man's mind, might, and morals.

(e) **The refinement aim.**—Refinement as the end of education is perhaps best typified by our ideal of the English gentleman, who is supposed to be gentle, courteous, sympathetic, considerate, and handsome; possessing refinement of thought and feeling, graciousness of speech and manner; in short, exhibiting all those qualities that make his intercourse with others most agreeable.

What has agriculture to contribute to this aim? For a certain genuine hospitality, considerate and knightly conduct, sympathetic and gentle treatment, people of the best rural breeding have always been famous. Communion with Nature as she manifests herself through plant and animal life; the consideration of her phenomenal expressions through her inert physical garments of soil, water, air, heat, and light; the knowledge of her simple mysteries and her astounding resourcefulness,—all these things tend to build up those ideals so necessary for the person of refinement. The study of agriculture as a mode of life and the consideration of rural social institutions, which are primarily based upon the agricultural industry, add the human element of the highest type, designed especially for the realization of rural refinement.

(f) **The cultural aim.**—During the progress of the centuries, the schools have gradually assembled certain fixed items of knowledge and conventional experiences of the race, the acquisition of which is called culture. They are the things that every educated person should know. In fact, an educated person as judged by this aim should know something about all those things that are generally accepted as the common knowledge and experience of the race.

A large portion of this common knowledge and experience is contributed by the science and practice of agriculture. Therefore, no one can be considered educated who is ignorant of the elementary principles concerned in the economic production of the common things of the farm. The city youth who went to visit his country uncle, and in an attempt to demonstrate his interest in his relative's affairs, remarked, when the honey was passed to him at dinner, "I see you keep a bee," cannot be said to have been educated. The question alone arises as to how much of agriculture the average educated individual should be expected to know.

"Agriculture is one of the most liberal studies for doctors, lawyers, merchants, teachers, and ministers. Probably no other subject appeals to so many persons. The interest in agriculture includes nearly all the population. A very large part of our city population, particularly the larger cities, is coming to take the keenest interest in agricultural questions. * * * The

movement for the ownership and management of farms by city men is remarkable. Nearly every one is interested in growing plants and animals, and there are some fundamental principles of this growth that every boy and girl should have an opportunity to learn, if they so desire; not that they may become farmers or farmers' wives, but for the educational training and intellectual interest in life that this knowledge brings. This training is often as desirable for those who are to live in cities as for those who are to live on farms. We can never wholly separate our interests from the soil on which we walk, and the plants and animals on which our life depends." [1]

It has been said that an educated person is one who knows much about one department of human experience and something about many others. There is perhaps no other subject through which this ideal may be so well realized as the subject of agriculture, since it touches so many phases of human life and involves so many other sciences.

(g) **The ethical-training aim.**[2]—Aristotle saw the need for the practical virtue of the citizen in his daily life. To secure this end it was assumed that education could mold the character of the young citizen so that the

[1] George F. Warren in *The Place of Agriculture in the Public High Schools*, Journal of Proceedings and Addresses of the N. E. A., 1910, p. 1098.

[2] Herbart, John Frederick (Translated by Alexis F. Lange and annotated by Charles De Garmo): *Outlines of Educational Doctrine*, 1909; p. 7 et seq. The Macmillan Company, New York.

practice of virtue between man and man should be assured. This view was also emphasized by the great educator, Herbart.

Agriculture as a mode of life, in which individuals constantly come into social contact, has abundant material serviceable for ethical instruction. Agriculture is also a business, and no field of human endeavor presents so great variety of opportunities for ethical training, nor is there any in which this training is more needed. Closely related to this aim is the religious basis of moral character. In the contemplation of life, and in studying its forms and the conditions of better growth and development, the youth secures a truer and clearer conception of his relation to his and Nature's God. Life in all its forms comes to have a fuller and more serious meaning, and life in its special form of human existence comes to have a loftier and more sacred significance, which ought to influence for good the relations of the individual with his fellows.[1]

(h) **The individual-adjustment aim.**[2]—From birth till death, man and his world need to be in constant, harmonious adjustment to each other. An individual's well-being is at all times conditioned by the forces operating in his environment, and education must prepare him to put himself into sympathetic relations with these, and to turn them to profit-

[1] See *The Teaching of Agriculture in the High School*, p. 181.

[2] O'Shea, M. V.: *Education as Adjustment*, 1903, pp. 317. Longmans, Green, and Company, New York.

able account. The man is best educated, therefore, who can best secure this harmonious adjustment to his own greatest comfort and happiness. The individual is the acting agent in securing this adjustment, for life implies the power and necessity of adaptation. The child comes into the world with no knowledge of the conditions for securing harmonious adjustments with his environment, and his education immediately begins and continues throughout the remainder of his life. During his youth, society through the school is supposed to give him systematic instruction concerning his life problem.

It is doubtful if any man can go through life without coming into contact with agricultural materials and conditions to which he must make adjustments; and in the country, men find the necessity for these adjustments persistent and continuous. The study of agriculture will assist the youth to make the necessary adjustments to Nature and her laws that he may become a better farmer. Considering the matter socially, a knowledge of agriculture will give the individual mastery of one of the chief avenues of social intercourse, since agriculture fills a large sphere in the life interest of our people.

(i) **The social-service aim.**—Social efficiency has been proposed as the ultimate aim of education. The minimum requirement of a socially efficient individual is that he must be self-sustaining, not merely economically, but socially. Besides this, he must not

block nor in any way hinder the true and legitimate progress of another, but it is desirable that he contribute a positive force in the evolution of society, and do his share in improving and satisfying human wants.[1]

Industrial efficiency is, of course, included in the aim now under discussion. Nearly one half of the people of our nation are engaged in the production of the raw materials of food, clothing, and shelter, and to be efficient to a maximum degree these should have a more or less thorough education in agriculture. The same statement also applies when agriculture is considered as a business, and as a mode of living.

There are many ways in which the individual may render positive social service, and through the medium of agriculture he may render service other than economic. The farmer who, in coöperation with the Creator, the sunshine, the rain, the air, and the soil, produces luscious, juicy, mellow fruit, tempting to the senses of taste, smell, and sight, or who produces flowers more delicate and beautiful than those which any painter ever reproduced, or who rears animals of perfect form and surpassing beauty, is an artist of at least equal merit with him who paints a representation of these upon canvas. The farmer's canvas is his fields, and his art materials are the soil, and the great

[1] Bagley, William Chandler: *The Educative Process*, 1908, pp. 58–65. The Macmillan Company, New York. Also Thorndike, Edward L.: *Education*, 1912, pp. 9–15. The Macmillan Company, New York.

forces wrapped up in the various physical manifestations of Nature. The artist-farmer brings perennial comfort and gladness to the countless millions of the race.[1]

In the foregoing discussion of the various aims of education and the relations that the subject of agriculture holds to them, together with the manner in which it may contribute to their realization, I have not desired to offer any defense for their validity. It has been the intention merely to show that the subject of agriculture may be used in formal instruction as a factor contributory to whatever end or aim of education might be entertained as the real one by those in authority over the schools. Men must be convinced of the potentiality of agriculture as a school subject, no matter what their notion of the ultimate aim of education may be, or whether it is professionally acceptable or not.

Review of Chapter IX

Do you recall—

The double purpose that is served by agricultural teaching? The test for determining whether a subject shall be included in the process of educating an individual? The various aims of education that have been or are now held to be the true ones? The elements of the livelihood aim; and how education in agriculture may contribute towards its realization? The same with reference to the

[1] Cf. *The Teaching of Agriculture in the High School*, p. 180.

knowledge aim? The same with reference to the mind-development aim? The same with reference to the complete and harmonious development aim? The same with reference to the refinement aim? The same with reference to the cultural aim? The same with reference to the ethical-training aim? The same with reference to the individual-adjustment aim? The same with reference to the social-service aim?

CHAPTER X

PEDAGOGICAL PROBLEMS INVOLVED IN THE TEACHING OF ELEMENTARY AGRICULTURE[1]

Elementary agriculture as a school subject is so young that one of the most difficult problems confronts us when we undertake to define its field. Both the content and the place in the program of studies of a school subject should be known before the formulation of its pedagogy is attempted. The first problem, then, in teaching elementary agriculture is to determine what portions—facts, principles, laws, and their applications—of this great subject may with profit to the child and the race, be taught in the elementary school.

The time was, less than a century ago, when practically no science of agriculture existed, although the art of agriculture is perhaps the most ancient. In America the passage of the Morrill Act by Congress, in 1862, laid the foundation for the building of a great science of agriculture; and through the application of its principles to the production of food, clothing, and shelter for man, or to the satisfying of his æsthetic desires, the most ancient art of agriculture has been transformed. When the land-grant colleges began

[1] Cf. pp. 29–34, *Journal of Educational Psychology* for January, 1912.

their work, many of the things which they taught were quite elementary. As agricultural investigations bore fruit, and new discoveries were formulated into principles, the body of subject matter gradually grew until there came to be a great mass of agricultural information that was available for teaching. With the rise of the agricultural high schools, and the introduction of the subject of agriculture into the regular American secondary school, at the beginning of the present century, much of the agricultural information that was considered elementary and secondary was handed over to these new schools and courses, for instructional purposes. Now, as the elementary and rural schools of the country are beginning to teach agriculture, a new division of the subject matter is being made, and certain phases of agriculture on the one hand, and of nature study on the other, are being formulated for use in elementary instruction. Just what these phases should be has not yet been definitely settled. However, a beginning is being made, and a few elemental and fundamental facts, principles, laws, and practices of agriculture are coming to be generally used. This instructional matter must meet at least three requirements: on the side of the home, the instruction should result in some immediate economic benefit, and in giving the boy an intelligent desire for farm life; on the side of the school, the boy should be prepared for continuing the agricultural work of the high school; and from the standpoint of the pupil him-

self, the matter of instruction should be adapted to his nature and capacity. To ignore any of these factors, must, at the present time, result disastrously to any portion of the subject, the presence of which may be desired in the elementary or rural schools.

The National Educational Association Committee on Industrial Education in Schools for Rural Communities recommended, in 1905, that agriculture be taught in the upper grammar grades, indicating especially the seventh and eighth grades, and possibly the sixth grade also.[1] The wisdom of this recommendation is becoming more apparent as the years pass by. Yet, attempts are being made in some quarters to introduce the teaching of elementary agriculture into all the grades of the elementary school. There is a possibility that such a procedure will be justified; the probability of its eventually succeeding is, however, seriously questioned, the error arising from the neglect to differentiate between agricultural nature study and elementary agriculture.

Because agriculture is both a science and an art, we are apt to think of it as being an industrial subject. This it is. We must, for the present, make a distinction between an *industrial* subject and a *vocational*

[1] See the *Report of the Committee on Industrial Education in Schools for Rural Communities* of the National Educational Association, pp. 44–46.

See also Bailey, L. H.: *On the Training of Persons to Teach Agriculture in the Public Schools*, p. 14, Bulletin No. 1, 1908, U. S. Bureau of Education.

subject, in that the former affords an avenue through which to train the motor propensities of the pupil, without the aim of training him for any certain trade; while the latter affords motor training of a specialized sort with the definite purpose of training the pupil in some given vocation. One gives motor development with the view of furnishing adjustments to the general environments of life; the other affords manual training with a view of securing adjustments to special conditions of society. One is a training for all youth no matter what occupation they may later enter; the other is the prerequisite training for youth who wish to enter some special vocation, as carpentering, blacksmithing, mechanical engineering, masonry, weaving, etc. One affords a large degree of general culture, while the lack of it is very noticeable in the other. Elementary agriculture comes under the first class—it is an industrial subject as well as cultural. Agriculture is both a science and an art, and if its being taught in the elementary school results in being later vocationally applied by the pupil, such will be only an incidental matter.

Since agriculture is not necessarily a vocational subject, and surely not so when taught in the elementary school, it is not to be taught as a vocational subject; and since it is not a science alone, it is not to be taught wholly like the pure sciences. Many of the principles of teaching used in the classical subjects are applicable to the teaching of agriculture. For

example, in the elementary school the pupil is taught the principles of writing a composition; but no good teacher will be satisfied with the pupil's training in this respect until he has acquired the ability of applying his knowledge in producing a composition. Just so in elementary agriculture; when a pupil learns the principles of raising potatoes, he should be able to raise them with some degree of success. As the composition is the expression of the pupil in the language class, so the patch of potatoes is the expression of the pupil in the class in elementary agriculture. If the pupil in writing his composition, omits the use of proper punctuation marks, it is an evidence that he has not learned his lesson well; the same may be said of the boy who secures few and small tubers at digging time because the bugs destroyed the potato tops.

Similar examples might be cited with the purpose of showing that many of the principles of pedagogy, indeed most of them, that were developed from the teaching of the languages and pure sciences are applicable also to the teaching of agriculture; and that others may be adapted. On the other hand, some of the principles applicable to the teaching of the vocational or trade subjects are not so desirable in the teaching of elementary agriculture.

The apprentice system was formerly quite efficient in producing skilled mechanics. The same method, somewhat modified, is to-day used in the technical

training of machinists and skilled workmen in the technical schools; the students learn their trades by working at them. In agriculture, however, it would be difficult to realize the true educational as well as the industrial aims to place a boy on a farm under the direction of a good farmer, although the boy might even develop into an excellent farmer in practice. Many good farmers, judged from the standpoint of education, are woefully deficient in their mental attainments, even possessing no liberal, clear, and systematic knowledge of their own business; and on the side of their physical development and adaptability, the same criticism holds equally true. In our efforts to get away from books and bookish methods of teaching, we must be careful lest we swing to the opposite extreme.

A very comprehensive problem is the matter of determining by experimental methods whether or not the principles of our present-day pedagogy, which have been evolved through the medium of the older school subjects, hold equally true when applied to this new field of semi-vocational-cultural training. If some modifications are necessary, just what are they and how shall they be accomplished?

The teaching of agriculture is largely a *synthetic* process, instead of *analytic*. We teach how to raise corn instead of teaching how it was raised. There are those who insist that the pupil should first go through the experience of certain agricultural operations be-

fore he is given the opportunity of studying the scientific aspect of these methods. He must raise some corn before studying its culture. The claim is that the pupil should first have the experience of applied science, so that, when he shall later study the scientific principles involved, he shall understand their significance more fully. This method would be the applied-science approach carried to the extreme. On the other hand, it is argued that the methods of agriculture—in the raising of corn, for example—which are taught to elementary school pupils, should be only such as have been thoroughly tested by practical agriculturists. It is, therefore, not essential that the pupil first raise a plot of corn before he studies about raising corn. If the pupil has had such experience at home, or the opportunity of acquainting himself by observation with the various phases of corn raising, such experience is not to be despised.

In accordance with the latter plan, which at the present time seems the more promising of success, the pupil is taught the elementary principles of agriculture throughout the school year, and near its close he is given the opportunity of applying his agricultural knowledge in a school garden, or home garden or field, whichever the case may be. This practical work should be carried forward during the following summer, if possible under the supervision of a competent teacher. The pupil's past training will give him weapons with which to attack agricultural prob-

lems as they arise in connection with his practical work. He now applies his science intelligently.

We still have the pure science and the applied science, or the economic, methods of approach. In the former, the pupil is encouraged to learn the facts, principles, and laws of science for their own sake, while in the latter he is appealed to by the economic applications to which these may be put. The former is the method that has been universally used in our schools in the past; but it has been pointed out,[1] and seemingly proved, that the economic method of approach is superior when considered by the test of results.[2] Of course we need further tests of this problem, especially on the large scale and under the normal conditions of the pupils in their local home communities with all the usual community and public-school factors in full operation. The work might well be carried out with botany and that part of agriculture that deals with plants. Either spring or autumn might be selected as the time of year. One hundred schools, more or less, should be selected and paired off so that the schools of each pair would have very similar conditions of environment, community, local factors, equipment, teachers, number of pupils, races,

[1] Hall, G. Stanley: *Adolescence*, Vol. II, pp. 153, 156–157. Appleton, New York, 1905.

[2] See the report of the experiment of J. P. Gilbert with pure and applied science methods of approach in secondary school science. *The Journal of Educational Psychology*, Vol. I, pp. 321–330.

etc. In one school of each pair, the pupils should study elementary botany *via* the pure science approach; in the other school, elementary agriculture by the economic-applied science approach. The topics of study should be the same in both cases. After a certain period results from all the schools should be compared. The work should first be outlined and subsequently supervised by two persons—one versed in methods as applied to teaching elementary botany and the other in methods as applied to teaching elementary agriculture. The teachers should first have general and specific instructions with reference to the purpose of the experiment, the work to be presented, and the methods of instruction. The examinations for all pupils should be of two kinds, one part on the basis of pure science, and the other on the economic or applied science basis. The results of these examinations should be passed upon by the two supervisors in charge. This would be a very elaborate and extended piece of work, but it would doubtless yield significant results.

Another educational problem, both administrative and pedagogical, concerns itself with the selection, organization, and teaching of a series of type habits associated with approved agricultural practice. Previously acquired habits very fundamentally influence future acts. Habits are stable and lasting to a degree quite equal to that of instincts and far greater than that of ideas. If ideas and instincts are sufficiently

important to be considered as determining factors in the organization of teaching materials, we see no reason why habits should not also be so admitted.[1] Two objects should guide in the selection of this proposed course of habits: namely, preparation for the high school course in "agricultural" habits, and preparation for making successful adjustments to the common and elementary conditions of farm life. "In the present status of habit training in the elementary school, pupils enter the high school without any adequate uniformity in the automatisms that they may have acquired. It is true that the pupils of a class often do possess many automatisms in common, but until greater progress is made in systematic habit training in the elementary school, the high school must content itself with using such automatisms as its pupils have incidentally acquired or assume the responsibility of first developing those habits that it wishes to make use of in later instruction."[2]

The selection of any program of habits must never lose sight of their practical usefulness in securing immediate and serviceable adjustments to farm environments and rural life. There are many conditions in rural life to the stimuli of which country children should respond with definite automatic reactions. Habits of doing certain things at given times are absolutely essential in successful farming. The habits

[1] Bricker, G. A.: *The Teaching of Agriculture in the High School*, p. 90.

[2] Ibid.

of selecting seed corn in autumn; of harvesting at the proper time; of storing grain properly; of grafting, mending tools, and doing other things that may be scheduled for the season of least activity; of cleanliness in milking; of testing the vitality of seeds; of starting early plants on time; of plowing when the season permits; of cultivating when conditions require; of cutting scion and stock quickly and accurately so that the two parts of the graft will fit together nicely—these are only a few of the habits that should be established in the life activities of every successful farmer. Although the teaching of all these various activities may not lie within the province of the elementary school, yet their enumeration will serve to give a conception of what is needed in the matter of habit formation. A series of type laboratory, field, and home-project exercises should be planned, with the object of furnishing the means of forming habits that the stimuli of farm life will tend to set into operation. These types should have an element of commonness with conditions that the pupil will likely meet on the farm. This common element in the situation of farm life and school training will suggest the use of certain habits previously learned at school; hence, the use of type practicums in developing skill in agricultural art. It is the element of commonness that gives the cue. There is at present great need for such a systematized series of exercises for the laboratory, field, and home work of elementary agriculture.

Some of the most important pedagogical problems of elementary agriculture, then, are summarized by the following list of questions: 1. What portions of the subject of agriculture are adapted for use in the elementary school? 2. In what grade or grades of the elementary school should elementary agriculture be taught? 3. Are the principles of our present-day pedagogy applicable to the efficient teaching of elementary agriculture? 4. Should experience in practical agricultural methods precede the study of the scientific principles involved, or should the facts and principles be first studied to be followed by their practical application or should the study of agricultural principles and experience in farm practice proceed concomitantly? 5. Which gives the better scholastic and practical results, the pure science, or the economic-applied science method of approach? 6. Is it feasible to organize and teach a series of "agricultural" habits in the elementary school?

There are only two ways by which correct and reliable answers to these questions may be secured; either by long and costly experience, or by immediate experimental methods.

Review of Chapter X

What can you say concerning—

The newness of the subject? The Morrill Act? Early work of the agricultural colleges? The work of the secondary schools? The work of the elementary schools? Three

requisites to be met? Recommendation of N. E. A. Committee? Agriculture as a science and an art? An industrial subject? A vocational subject? The position of agriculture as a school subject? Teaching agriculture as a science and an art? Methods of teaching agriculture? Synthetic process? The applied-science approach overemphasized? Information, then practice? The pure and applied-science methods of approach in teaching? Explanation of terms? An experiment to determine results of methods? Teaching type habits in agricultural activities? The importance of habits? Aims in the formation of agricultural habits? The enumeration of a few type habits? Need of developing the idea of habit formation in education?

CHAPTER XI

THE ADMINISTRATION AND TEACHING OF SCHOOL AGRICULTURE

I. Administration

THE administration of elementary education in agriculture has reference to the provision and the arrangement of facilities for instruction in this branch. The equipment, as teachers, apparatus, texts, gardens, and tools would come under this head; also, the organization of the course of study and its location in the program of studies, its relations to other subjects in that program, and the purpose for which the course is to be taught.

The Committee on Industrial Education in Schools for Rural Communities of the N. E. A. recommended in 1905 that, "After the explicit nature study ceases with the fifth grade, the pupil in the rural school may then be taken through the elements of agriculture in the sixth, seventh, and eighth grades." [1] Notwithstanding the fact that this recommendation was made at a time when elementary agriculture was just coming out of its nature-study swaddling clothes, it can be but little improved upon to-day. Gradually, however,

[1] See the report of the Committee, p. 44.

real elementary agriculture has come to be limited mostly to grades seven and eight, while the work of the preceding three grades has come to be agricultural nature study. Agricultural nature study is to elementary agriculture much as reading is to literature; the former furnishes the key by which the great riches of the latter are attainable. In elementary agriculture, the facts, principles, and experiences of agricultural nature study are used in the further acquirement of agricultural knowledge and experience. They are built into a system, and we have therefore, the beginnings of a science.

The placing of elementary agriculture in the upper grades of the elementary school, and nature study in the lower is thoroughly pedagogical. At different ages in the life of a child, he is dominated by different psychological manifestations. These dominant manifestations will determine the place as well as the aims of any subject in the program of studies. In his latter pre-adolescent age, the child becomes decidedly utilitarian in his thought and life, and consequently distinctly economic. Now, while the economic aim, as we have seen in a preceding chapter, may be regarded as one of the aims of nature study, it cannot be accepted as the chief one. In elementary agriculture, however the predominance of the economic aim becomes its distinguishing purpose as a subject of study and teaching. The time for teaching so utilitarian a subject, therefore, should be at

that period of the child's development when he comes to have a distinctly practical outlook upon life. This is about the time that he reaches the sixth or the seventh grade of the elementary school.

A distinguished writer on nature study says: "There are comparatively few schools in which there is any definite place upon the program for work in nature study. * * * I am quite convinced, when we reach our ideal program there will be no period for nature study found upon the schedule." We should not say so with reference to elementary agriculture, which should be taught as a distinct and separate branch, with a definite assignment of place on the daily program and in the curriculum.[1]

II. Teaching

The course in elementary agriculture should be formulated in obedience to five essential principles:

First, the course should be general in its nature. As all the land of the world has been divided into five grand divisions, so the great subject of agriculture may also be divided: namely, plant studies, animal studies, farm management and machine studies, soil studies, and studies and practice in production. Any adequate elementary course should include the

[1] For a fuller discussion of the question as to whether or not agriculture should be taught as a separate science, the reader is referred to pages 46–55 of the author's *The Teaching of Agriculture in the High School.*

study of the more evident facts and principles from each of these divisions.

Second, the subjects chosen for study should be fundamental, not trifling or unimportant. For example, a knowledge of the duality of animal forms in accordance with differentiation of production that runs through the various families of domestic animals, and the ability to recognize and point out the more striking characteristics of these types is at once both general and fundamental agricultural knowledge, and has its place in a rudimentary course of agriculture.

Third, the objects, facts, and principles should be arranged in the course so that they may be presented in a systematic order. The course, though elementary, should be a unit, complete in itself. It should be well balanced in that no one grand division receives much greater emphasis than another. If we are to teach elementary agriculture as a science, this requirement will be quite fundamental.

Fourth, the elementary course in agriculture should include as objects of study, the common things of the farm. This implies the exclusion of those things that are quite unfamiliar to the pupils. There is positively no excuse for the study of the zebra or the ostrich by the vast majority of the country and village children of the United States, where the cow and the turkey are better known and enter very intimately into their life experiences. Obedience to the *law of apperception* requires that this principle be followed

in the construction of a course of study in elementary agriculture.[1] This principle precludes the possibility of having a "cut-and-dried" course in elementary agriculture that is universally applicable. Only suggestive courses may be outlined, for there must be modifications of any general course to suit local conditions. Hence, each country, section, state, and even county will need a course of study in elementary agriculture that will embody the objects and principles most familiar to the agriculture of the locality or natural territorial division.

Fifth, the course in elementary school agriculture should be so planned and constructed as to follow the course of the seasons. This principle is known as the *seasonal sequence* and involves the right selection of any agricultural topic for study during a given season of the year. Briefly stated, this principle is: *At any given season of the year, teach those agricultural things in which the farming community is interested at that time.*[2]

A good textbook, while not an absolute necessity, is yet strongly recommended for the use of both the teacher and the pupil. The teacher will use the book as a manual by which to be guided in the progressive and orderly teaching of the subject. The textbook is itself the embodiment of the author's methods for

[1] See pp. 58–63 of the author's *The Teaching of Agriculture in the High School* for a fuller discussion of this principle.

[2] Ibid., Chapter VI, "The Seasonal Determination of Sequence."

teaching the subject. The pupils should always have a convenient and familiar book in which the fundamentals of the subject may be read and studied. Dependence upon bulletins is unsafe, because as a rule, they are not pedagogically written, because they tend to lead the inexperienced teacher to overemphasize the particular subjects considered in them, and because they are seldom at hand in sufficient quantities when most needed. Bulletins and magazines should be kept on file for reference use.

The main purposes for teaching agriculture in the elementary school are cultural and pre-vocational. With respect to the first, no person can be said to be educated or cultured, who does not know something about agriculture, and who has not enriched his life with some of its experiences. In respect to the latter, it must ever be maintained that the elementary school of the people cannot be made vocational in the methods or the results of its training. Its subjects of instruction must ever be pre-vocational. In the elementary school, for example, we give the child a taste, a glimpse of what the practice of medicine means by teaching him a "smattering" of that vocation, which we call elementary physiology; in much the same way, through the study of physics, geometry, history, and civics the child gets a glimpse of what is involved in the vocations of mechanical and electrical engineering, civil engineering, and law, respectively. These elementary subjects may in this sense, be regarded as pre-vocational

subjects. In much the same way the agriculture of the elementary school may be regarded as pre-vocational with respect to the business of agriculture. As teachers, we cannot hope to make efficient farmers of children of tender years, who have received only a simple course of instruction in agriculture in the elementary school, or even the high school, where the subject is taught as a non-vocational subject. It ought to be stated here that fond parents and designing politicians ought not to expect the impossible of the public schools.

III. A Suggestive Outline for a One-Year Course in Pre-vocational Agriculture

FIRST HALF-YEAR

1. Plant studies of matured plants, fruits, roots, and seeds. Autumn—September and October, eight weeks. Begin with the study of the products of those plants most familiar to the pupils. From the study of the fruits and products, proceed to the plants producing them. These studies should be approached from the economic point of view. Orchard fruits, trees, weeds, tobacco, cotton, corn, wheat, and the more important grains and grasses, roots and tubers, and the injuries from plant diseases and insect pests are among the principal subjects for study. There should be exercises in judging. An ideal of superior plants and fruits as well as of greater yield should be established in the minds of the pupils.

2. Animal studies. Late fall and winter—November and December, six weeks. Begin with the animal products most familiar to the pupils and then proceed to the study of the animals themselves. Use the economic and applied-science approach. Animal types and breeds should be studied, and there should be exercises in stock judging. Milk, butter, wool, meat, eggs, and animals yielding these products, feed and feeding, and the proper care of farm animals are among the topics that should be considered. The desirability of superior production of quality and quantity should be emphasized.

3. General farm management and machine studies. —(a) *Farm management.* Winter—December–January, four weeks. Agriculture should teach not only the principles of the production of economic materials but also the methods by which these materials when produced may be conserved. General farm plans, systems of crop rotation, the plotting of orchards and gardens, the management of the dairy, plans for building, systems of drainage, construction of fences, farm records and finances, and special farm problems are some of the topics that should be given consideration at this time.

SECOND HALF-YEAR

(b) *Machine studies.* Winter—January, two weeks. Begin with the simple farm tools, and then approach those machines most familiar to the pupils. Consider

construction and the relation and function of parts. Make use of the motor propensities in the children. Emphasize the need of properly caring for machinery. Take to pieces and set up several farm machines. Study types and the reasons for the kind of work done.

4. Soil studies. Late winter and spring—February and March, eight weeks. Simple soil studies should first be made. Such things as the types and composition of soils, humus, mulch, drainage, various relations existing among soil, water, and air, soil fertility, soil fertility tests, fertilizers, and the use and care of manures may be studied. The economic appeal to the pupil may here be made very strong but the ideal of the conservation of soil fertility for future generations should not be missed.

5. Studies and practice in production. Spring—April and May, eight weeks. Under this head are combined and applied many of the principles previously learned. The central features here are the developing plant and animal. The relations that soils, moisture, temperature, light, fertility, cultivation, insect pests, and plant diseases bear to plants; and the care, feeding, sheltering, and selection of animals should be duly considered; while the best methods of harvesting, storing, grading, and marketing the products of both animals and plants should be emphasized. A greenhouse, a demonstration field, hotbeds and coldframes, home projects, and if possible, the maintenance of marketing relations with consumers, are

quite essential for properly carrying out this phase of the subject of agriculture. Provisions should be made for work in practical agriculture throughout the entire ensuing summer.

Notes

Half-year courses should attempt only one half of the work here outlined. Since agriculture is both a science and an art, both learning and doing are involved.

An ideal course in agriculture is a series of type recitation, laboratory, and field exercises made up of carefully selected materials, systematically and pedagogically arranged, around which lectures, reading, and quizzes center as supplementary work. The core of the course should bring the pupil into vital contact with the material objects and natural phenomena.

It is recommended that credit in the subject of agriculture be not given until the next September after the pupil begins the course, thus giving him an opportunity to demonstrate his ability for successfully applying his training.

With proper modifications this outline may, in a general way, be followed in the upper grammar grades of the elementary school, as well as in the non-vocational high school.

IV. The Teacher

A book might be written on special methods in agricultural teaching. We must, however, forego an elaborate discussion of the subject here and confine ourselves to a few fundamental suggestions, and to the making of a few timely cautions.

For several years to come the majority of teachers of agriculture in the schools will be drawn from three distinct sources: namely, from the teachers of nature study in the grades, from agricultural college gradu-

ates, and from the science teachers in the high schools.[1] Each of these classes of teachers is prone to certain mistakes, which will be indicated below, in the hope that the liability to err may be anticipated and guarded against as much as possible.

The nature-study teacher is apt to carry her methods of instruction bodily into the teaching of agriculture. Notwithstanding what has been said by some writers as to the desirability of this, such a procedure is a grave error. The nature-study teacher instructs with no idea of building the lessons into parts of a great science; the teacher of agriculture not only should do this consciously, but should also bring the pupils to this realization. Lessons in nature study very often have aims and ideals other than economic as has been shown in a previous chapter; but, with very few exceptions, the predominating aim in a lesson in agriculture will be economic. In nature study, for instance, the mouth parts of an insect are studied in terms of the part they play in the economy of the animal's daily existence; but in agriculture these things are studied with reference to contributing, ultimately, to the welfare of man.

The methods of approach in nature study are idealistic, often beginning with a story, a guessing game, a

[1] See the author's *The Teaching of Agriculture in the High School*, pp. VIII–IX. Also Hummel, William Granville; and Bertha Royce: *Materials and Methods in High School Agriculture*, 1913, pp. 354–355. The Macmillan Company, New York City.

novel sight or experience, and ending with a satisfaction growing out of a mental condition—knowledge, reflection, wonderment. The method of approach in agriculture is materialistic, frequently beginning with the commonest farm object or experience, and resulting in a job and a bank account. The nature study of to-day as known in the formal education of American children is a subject that has become intimately associated with the primary and lower grammar grades. It is taught by methods necessary in the teaching of little children. The boys and girls of ten to fifteen years are quite different from the younger group in their instincts, their experiences, their motives, and their development generally. This is eminently the age of the boy scout and the campfire girl. Desires of physical prowess, shrewd outwitting, and economic gain are very prominent characteristics displayed by these youngsters. The methods used in teaching them must take account of such things. The utilitarian attitude which shows the *use* of the subject; the industrial method, which *exercises* the muscles as well as the brain; the economic result, which *repays* efforts and satisfies worthy desires will all be employed by the wise teacher of pre-adolescent and adolescent children. Perhaps there is no other subject with which these principles of teaching can so well be used as with agriculture. The nature-study teacher, to become a teacher of agriculture, must not forget to readjust her methods and aims. She will recognize

the new piece of human nature that she is to teach; and she will, therefore, not fail to select new materials and organize them on a new basis for instructional purposes.

The agricultural college graduate, as experience has shown, invariably has his troubles. These arise from three distinct sources. First, he does not understand the children. Association for a period of four or more years with adults has given him the point of view in education in which only matured minds, bodies, experiences, and lives have entered. He needs to realize that the pupils in the elementary and high schools are immature, untrained, and inexperienced. The driving home of this realization is frequently too long delayed. In the second place, the graduate or student of the agricultural college knows little about teaching methods. He knows agriculture, but not the child. The abundance of knowledge that he emits falls like a cataract over the heads and lives of the children, who emerge with the realization that there has been a flood, but show scarcely any evidence of moisture. A knowledge of the science of teaching, as well as the ability to apply it in practice, is quite essential in securing efficiency in education as a knowledge of the subject taught. One would suppose that this class of teacher should acquire some knowledge from his professors, and practice this by imitation; but, unfortunately, the lack of training and ability in teaching does not always exclude learned men from the

active teaching staff of our colleges and universities. Third, while the agricultural college graduate may know his subject thoroughly, he rarely knows what to omit or what to include in teaching it to the pupils of the public schools. He has gathered a fund of agricultural knowledge with the intention of using it on the farm, and not for instructional purposes. His knowledge has not been "educationalized." He does not know the philosophy, or the science, or the art of education; and never having been taught either by precept or example, why shall we expect him to understand, or to practice successfully, the teaching business? If he has been trained to be a farmer, a farmer he should be. One of the chief economic wastes in our educational system arises from the blunders of those who do not understand the business of education and teaching.

The high school science teacher seldom holds the proper attitude toward the subject of agriculture, especially if his training has been in the usual college sciences other than agriculture. Except in the engineering colleges and the trade schools, science is seldom taught as applied. The majority of college graduates, therefore, know only pure science, while agriculture, in so far as it is a science, is an applied science. The attitude toward agriculture as a science should be industrial as well as cultural. But agriculture is more than a science: it is an art and a business. The science graduate will probably not have had any train-

ing in the art or the business of agriculture; therefore, he cannot be regarded as having had adequate preparation to teach a subject two thirds of which he knows little or nothing about. If the average science teacher is permitted to teach the agriculture of the high school, the result must be that the pupils will have only a partial and lopsided view of the subject.

There is another very serious error into which the science teacher is likely to fall, and this has reference to the methods that he uses in the teaching process. He will in all probability, by example and through his practice teaching of science,—if by good fortune or unusually wise guidance he has received such necessary training—have acquired the pure science method of approach. Pure science methods, however, are not applicable to the teaching of agriculture without important modifications. The applied-science method of approach must be used. There are two fundamental reasons for this: first, because the subject itself is largely an applied science; and second, because the pupils of the public schools, capable of receiving intelligent instruction in this subject, are more readily appealed to and taught by the applied-science method of instruction. The most important thing in teaching facts and principles in agriculture is that the young men shall understand their application to farm practice. There is little excuse for teaching anything in agriculture to country children without also teaching its application to the life and work of the farm. The

only exceptions to this rule would be in the cases of the girls who may never be called upon to assume any of the responsibilities of farming operations; and the pupils in city schools, who have a limited field for the application of the facts and principles of agriculture but who nevertheless, should, as a matter of culture, know something about agriculture. In view of these various handicaps, the science teacher is apt to view the subject of high school agriculture unsympathetically.

There is a fourth class of would-be teachers of agriculture, but these scarcely deserve notice in this discussion. They are persons who have been "raised on the farm," and who therefore think themselves amply qualified to teach agriculture. If this is their only qualification there is certainly no excuse for their employment.

The question naturally arises here, from whence will come our best new teachers of agriculture in the future? They will come from the *agricultural education departments* of our normal schools and agricultural colleges; and by the words in italics are meant those departments that give definite training in the theory and practice of teaching the subject in all grades of educational institutions including the elementary school and the college.

The use of the printed page as a means and especially as a guide in teaching agriculture in the public schools and colleges is not to be discouraged; but its over-use

is to be condemned. The teacher must ever be mindful that the subject which he teaches is based primarily upon the commonest things of the farm and garden; that the book is only a record; that facts are gained, verified, and clarified by constant reference to the animal, the plant, the soil, or successful practice; and that the inspiration which comes from contact with the real physical object is not nearly so apt to disappear when brought into contact with real life on the farm as is that enthusiastic inspiration so often gained from mere books.

As a final caution, teachers of agriculture should endeavor to secure definite and sure reactions to what they teach. This means that the pupils should become the possessors of clear-cut knowledge which flows out into actual practice. For example: after the importance of giving good care to milch cows has been studied, the student should be able to enumerate definite things that constitute the proper care of cows, and the cows at his home should realize that something definite has occurred to the boy.

Review of Chapter XI

Epitomize what is said concerning—

The recommendation of the N. E. A. Committee on Industrial Education for Rural Communities. The teaching of nature study in the lower, and elementary agriculture in the upper, grades of the elementary school. The five principles that govern the formulation of a

course of study in elementary agriculture. The use of a textbook in teaching school agriculture. The main purpose in teaching agriculture in the elementary school. The topics to be studied and their arrangement in a suggestive course of study. The three sources from which teachers of school agriculture are to be drawn. The shortcomings to which each of the three classes of teachers is liable. The probable sources from which the best teachers of agriculture of the future will be secured. The use of the printed page in teaching agriculture. Definiteness in teaching agriculture.

CHAPTER XII

THE COÖPERATIVE USE OF APPARATUS, EQUIPMENT, AND ILLUSTRATIVE MATERIAL

The apparatus required in the teaching of public school agriculture greatly depends upon the nature of the work, whether it is elementary or secondary. Apparatus used in the teaching of elementary school agriculture is usually very simple, and may often be made by local artisans, or sometimes by the teacher and the pupils. The same is true, to a somewhat less extent, of the apparatus needed in high school instruction. There is much apparatus, however, that needs to be accurate, and this should be purchased from a reliable firm. Cigar-box and tomato-can apparatus has no more place in the teaching of scientific agriculture than has similar apparatus in the teaching of botany, physics, or chemistry. In no subject can rural school officials better afford to invest money than in agriculture; for the economic returns resulting from instruction in this subject are much greater and more immediate than from any other subject now taught in the public schools.

The teaching of the physical and biological sciences by the laboratory method, which necessitates a more or less complete laboratory equipment, including ap-

paratus, as well as a good supply of materials, is an expensive undertaking. If separate laboratories, equipments, sets of apparatus, and duplications of materials were required for each of the scientific subjects now taught in the schools, the expense indeed would become burdensome. Fortunately, the same laboratory, equipment, set of apparatus, and materials may, to a large extent, be used in the teaching of the various physical and biological sciences. By means of this coöperative use of equipment the expense of teaching the natural sciences may be greatly reduced. For the same reason, the introduction of a new science into the program of studies may not greatly increase the total cost of instruction.

There are at least two different senses in which there may be a coöperative use of equipment and illustrative materials depending upon the relation of those who coöperate in the use of these things. Briefly stated they are as follows:—

(1) Classes studying the same subject in different schools may, under certain limitations, use the same equipment and materials.

(2) Classes in the same school studying different subjects may, in a number of cases, use the same equipment and materials.

1. Coöperation in the use of equipment and materials in the first sense either may apply to a number of rural schools, all under the jurisdiction of the same body of school officials; or it may be applicable to the

high and elementary schools in the same building, as is usually the case in village and centralized rural school districts. The agricultural teacher, laboratory apparatus, and materials used for the instruction of the high school classes may also be utilized to a very large extent for the elementary school classes in the same subject; the limitations being set only by the difference in the character of the work given to these classes. In the case of the scattered rural schools, however, the limitations are still greater. The laboratory cannot be conveyed from place to place, neither is it usually found feasible to employ an itinerant teacher of agriculture; but the limited amount of apparatus needed in teaching rural school agriculture, and some of the materials, may easily be conveyed from school to school according to some plan of progression. Especially is this true under district and township supervision. Even in states having county supervision, the county might be divided into "cooperative districts." The writer knows of an instance where the same milk tester was used in the agricultural instruction of the eleven different rural schools of a township.

2. Coöperative use of equipment and materials in the second sense has especial reference to the classes of a single school in different scientific subjects. Many of the physical and biological principles and laws are found in two or more of the subjects pursued as separate courses of study in our schools. For example,

the principle of "centrifugal force" is considered in both the subject of physics and in agriculture: in the former, as a purely scientific principle, and in the latter, as a practical application in the testing of milk and the separation of cream. In the former case, the principle may be illustrated by means of a "centrifugal machine"; while in the latter a milk tester is used. If the school teaches both physics and agriculture, the milk tester may be used equally well in both classes—in one to illustrate, in the other to apply the centrifugal principle.

A suggestive list of various pieces of apparatus and a few materials that may be used in both the teaching of agriculture and in some other science usually taught in the public schools is given below:—

Apparatus

1. The milk tester—physics, *centrifugal force.*
2. The cream separator—physics, *centrifugal force.*
3. The drainage apparatus—physics, *pressure of free liquids, capillarity, porosity, saturation, impenetrability.*
4. The riding plow—physics, *principle of moments.*
5. The corn plow—physics, *classes of levers.*
6. The pruning shears—physics, *lever of the first class.*
7. Farm machinery—physics, *elementary machines.*
8. The seed-corn tester—botany, *growth of stem, roots, root-hairs.*
9. Soil tubes—physics, *capillarity, adhesion, porosity.*
10. The balance—physics, chemistry, *mass.*

11. The magnifier—botany, zoölogy.
12. The microscope—biology.
13. The Bunsen burner—physics, chemistry, biology.
14. Test tubes—physics, chemistry, biology.
15. Flasks—physics, chemistry.
16. The graduate—physics, chemistry, biology.
17. The hydrometer—physics, chemistry.
18. The thistle tube—chemistry.
19. The pipette—physics, chemistry, biology.
20. The stand and rings—physics, chemistry, biology.
21. The thermometer—physics, chemistry, biology.
22. A set of measures—physics.
23. A yard-and-meter stick—physics.
24. A portable oven—biology.

Materials

1. Sulphuric acid—physics, chemistry, biology.
2. Chemicals—chemistry, physics, biology.
3. Gravel, sand, and soil—physical geography, botany.
4. Domestic animals—zoölogy.
5. Domestic plants—botany.
6. Litmus paper—chemistry.
7. Specimen mounts—biology.
8. Seeds—botany.
9. Fertilizer ingredients—chemistry.
10. Tree seedlings—botany.

Moving pictures seem to offer another promising method for illustrative teaching in agriculture through coöperation of a large number of schools with moving picture film companies. Moving picture cameras

may be operated at plowing, sheepshearing, apple-packing, and other agricultural contests; at state fairs, animal shows, and various exhibits of agricultural machines and products; at the agricultural colleges and experiment stations; and on the best farms in various sections of the country. Satisfactory moving picture machines may now be installed by schools at a very moderate cost. By means of them, not only school children, but the adults of whole communities may be entertainingly instructed in the best farm practices, in the latest inventions applicable to the agricultural industry, and in comparative husbandry. Famous animals in all but their living presence may be brought to every community at a trifling cost. The various uses to which this method may be put will naturally expand in the usual process of evolution.

Review of Chapter XII

What will determine the kind of apparatus to be used in teaching agriculture? Why should the use of good apparatus be encouraged? Why is the teaching of scientific subjects relatively expensive? How may this expense be reduced? Explain two different ways in which there may be coöperation in the use of apparatus, equipment, and materials. Recite a list of agricultural topics in the teaching of which use may be made of the apparatus, equipment, or materials commonly used in teaching other sciences. What use may be made, coöperatively, of the moving picture machine and films?

CHAPTER XIII

THE AGRICULTURAL DEMONSTRATION FIELD AND HOME PROJECTS

IN order to afford pupils an opportunity to acquire an agricultural experience, to make practical applications of their knowledge, to demonstrate or verify certain agricultural principles, and in some instances to make agricultural experiments, there are now two methods in common use: namely, the *agricultural demonstration field* and the *home project.* As methods to secure certain ends, both have demonstrated their value; both, also, have their limitations.

I. The Demonstration Field

The school garden was the forerunner of the demonstration field. With the rise of nature study as a school subject, school gardens came into being and became a valuable adjunct to nature-study teaching. Not only does the school garden bring the child into intimate contact with nature, but from it are drawn valuable materials for study in the classroom. The school-garden movement in America has been mostly confined to the cities, where it has attained its most eminent success. With but few exceptions, however, the movement has never succeeded well in the villages and the

open country. There are many reasons for this. First, the children of the open country and villages have ample gardening experience in the family gardens at their own homes, and the school garden is usually looked upon by the children as an unnecessary enterprise, or a sort of "play garden" when compared with the real garden at home. Secondly, the children of the rural districts and villages are kept busy by the many chores of the home and there is little or no "idle energy" to be kept busy as in case of thousands of city children who never come to know, experimentally, the valuable training that results from doing chores. Thirdly, the homes of the children of the country are too distantly scattered to permit the close and frequent attention necessary to make school gardening enterprises successful. There may be additional reasons, but these are the most obvious.

The school garden has come to be an institution of the grades in city schools. It is the adjunct of the nature-study course, and is dominated by nature-study methods. It is not intended to serve scientific purposes, but the purposes of nature study. The gardens are usually small, consisting of back yards and vacant city lots. The plots of individual pupils frequently measure only 5 feet by 10 feet, or even less. The economic aim seldom receives serious consideration from the practical standpoint. The school garden, encumbered with its traditional ideas and practices, its limitations in purpose, its restrictions in size, and

its lack of definite scientific aims, is ill adapted to serve the best purposes of school agriculture. The school-garden idea, as it exists to-day, needs to be greatly modified, in respect to purpose, organization, management, and size when used as an adjunct of school agriculture; and even another name is suggested to indicate the truer meaning of the piece of ground used in connection with the class in elementary or secondary agriculture.[1]

[1] The following references are given for the benefit of those who desire to make a further study of the school garden:

Jewell, James Ralph: *Agricultural Education Including Nature Study and School Gardens*, pp. 148. U. S. Bureau of Education, No. 2, 1907. (See Bibliography, pp. 128–133.)

Greene, Louise: *Among School Gardens*, pp. 388, 1910. Charities Publication Committee, New York.

Davis, B. M.: *School Gardens for California Schools*, pp. 79, 1905. Bulletin No. 1, State Normal School, Chico, California.

Sipe, Susan B.: *School Gardening and Nature Study in English Rural Schools and in London*, pp. 37. U. S. Office of Experiment Stations, Bulletin 204, 1909. Washington, D. C.

Galloway, B. T.: *School Gardens*, pp. 47, 1905. Bulletin No. 160, U. S. Office of Experiment Stations, Washington, D. C.

Babcock, Ernest B.: *Suggestions for Garden Work in California Schools*, pp. 48, 1909. Circular 46, University of California, College of Agriculture, Berkeley, California.

McCready, S. B.: *Gardening for Schools*, pp. 32, 1906. Bulletin 152, Ontario Department of Agriculture, Toronto, Canada.

Pierce, John B.: *School Gardening*, pp. 11, Hampton Leaflets, April, 1906. Hampton Institute Press, Hampton, Va.

Macfeat, Minnie: *Elementary Agriculture and School Gardening*, pp. 40, Bulletin No. 4, April, 1910. Winthrop Normal and Industrial College, Rock Hill, S. C.

The demonstration-field idea is a more serious effort to apply systematically the principles and practices of scientific agriculture to the management of the soil and the cultivation and production of farm and garden crops. Here is where the pupils are given an opportunity to apply much of the knowledge of agriculture which they have acquired during the school year. After they have learned about plants and their cultivation, soil and the principles of its management, opportunity should be given the pupils to have some practical experience in the art of agriculture. To learn the theoretical principles of potato growing is not sufficient; the boy needs, in addition, to get on the business end of a hoe or plow. The demonstration field affords a practical means for accomplishing this purpose. It is here where about half of the year's work is correlated and summarized.

Gang, E.: *School Gardens*, pp. 1067–1084, Report of U. S. Commissioner of Education for 1898–99. (Historical.)

School and Home Gardening, pp. 45. Bulletin No. 31, 1910. Bureau of Education, Manila, P. I.

Nathan, Stella and Miller, Caro: *Lessons in Gardening and Nature Study*, pp. 37. Director School Gardens, Philadelphia, Pa.

Corbett, L. C.: *The School Garden*, pp. 40, 1905. Farmers' Bulletin 218, U. S. Department of Agriculture, Washington, D. C.

Various publications of the Home Gardening Association of Cleveland, Ohio.

Annual reports of the Winnebago County Schools by Co. Supt. O. J. Kern, Rockford, Ill.

The Rural Educator, Vol. III, Nos. 1, 2, 3, and 4 (January to April, 1914) The Rural Educator Co., Columbus, Ohio.

It makes little difference, from the educational point of view, whether the field is owned and operated by the school, or whether fields at home are at the disposal of the pupils. In most rural districts and in many villages, it will be found impracticable to maintain a school field. Where it is found practicable, the school demonstration field is to be recommended. To other schools, a field at home for each pupil will be a valuable adjunct to the work in agriculture. In both cases the teacher of agriculture should be the general supervisor of the work carried forward.

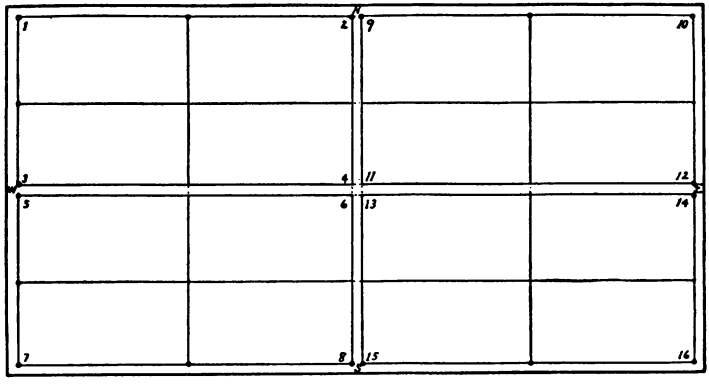
The demonstration field is to a course in school agriculture, what the laboratory is to a course in physics. The field should in fact be one of the out-of-door laboratories of the agricultural class. It is better than any blackboard, for it deals with first-hand materials. Its examples are living realities that challenge the most skillful master. Life and increase are the rewards of the young farmer's success; death, the result of his failure. Familiar life problems are presented in its management wherein the common school subjects—as arithmetic, composition, reading, geography, and physiology—are utilized in finding their solutions. The mistakes of the field are not easily erased, and their stubborn persistence teaches valuable lessons not easily forgotten. On the other hand, the successes do not easily fade but become more apparent with each day's growth, continually inspiring the ambition of the boy to greater and better achievements. Without

further discussing the educational values of this idea, let us turn to the practical phases of the planning and the making of a demonstration field. What we have further to say on this subject is especially applicable to the seventh and eighth grades and to the high school.

The size of the field will depend on the number of pupils who are to cultivate and care for it. Each pupil should have at least one eightieth part of an acre—two square rods—if the work is to be done at the school; if the work is to be done at home, a much larger area might easily be cared for. The present discussion will concern itself with the school demonstration field, and appropriate modifications may easily be made in the case of the home field or club acre. One fortieth of an acre, or more, may be given to each pupil, if the school has a sufficient amount of land at its disposal and the pupil promises to give the extra care needed outside of school hours. However, one eightieth of an acre will be the unit here used. If the class in agriculture numbers twenty pupils, a one-fourth-acre tract of land will be sufficient for providing an individual plot for each pupil. But there is another consideration. It has been found, by experience, that it is advantageous to have about one fourth of the field cultivated and cared for by the pupils in common.

The size and shape of the unit or individual plot should be one rod wide by two rods long. Four of these plots are conveniently placed together in one group. Around each group should be a two-foot path. By such

an arrangement, each plot will have a path on a long and a short side. The following diagram of a garden will make this arrangement clear. A three-foot path should



surround the field. The longer dimension of the plots may extend in any direction, but the preference lies with the east and west. It is recommended that it be planned to run the rows lengthwise of the plots, and that the rows extend continuously across all of them from one end of the field to the other. This will make cultivation by horse power more easily performed. The tall plants should be placed in the most northerly plots and rows, and those that do not extend far above the surface of the ground in their habits of growth should be kept to the south side of the field. In this way no plants will be shaded by taller ones standing to the south of them. If a fence must be built about the field, it is recommended that the ends be made of removable panels, or a strip of sod be main-

tained at each end of the field inside the fence, so that in using a horse in cultivation, he may be turned outside of the cultivated area when the ends of the rows are reached.

After the site has been chosen, the ground should be plowed. This should be done as early as possible in the spring, if, indeed, it was not done the previous fall. After the soil has been somewhat pulverized by disking and harrowing, the area should be measured off into groups of individual plots, with proper allowances for the paths between the groups and around the whole field. The writer has found it advantageous to measure around the whole space, driving stakes at the intersections of all boundaries of plots with the borders, as indicated by the dots in the diagram. Cords of binder twine may then be stretched across the field both ways and attached to the border stakes. Afterwards a stake should be driven at the intersections of the cords, each of which should be fastened to the stakes with staples. After this is done, all cords crossing paths (indicated by dotted lines in the diagram) should be cut away. Each plot will then be inclosed by a cord. When the crops are up, the cords may be removed if desired. This method saves much unnecessary measuring and walking.

When the plots have been staked and lined, they should be numbered with markers and assigned to the pupils. A group of plots, equal in area to one fourth or one fifth of the whole field should be reserved for the

"common lot" where all the pupils may have an opportunity to work at various times, especially if any finish their work before the others are through. Work will then begin on the preparation of the seed bed as soon as the season and the condition of the soil will permit.

Under proper restrictions, it will be found wise for the teacher to permit the pupils to select the crops they are to grow. The crop or crops selected should be made the object of special study. In some cases it may be sufficient merely to produce a harvest; but in most cases some experiment should be made or some agricultural fact demonstrated or verified. For example, if a boy should choose potatoes for his plot, it might perhaps be sufficient for him to demonstrate his ability to raise a crop of potatoes. In addition, he might demonstrate, for example, the values of mulch by cultivating the halves of his plot in different ways. Two or more boys might work together to show the effect of various methods of cultivation; two boys might show the relative values of dust and straw mulches; a third and a fourth, the relative effects of deep and shallow planting; and a fifth and a sixth the difference resulting from spraying and the lack of it. These are merely suggestive experiments and demonstrations. Each crop presents its problems, for the solution of which experiments may be carried on; and its facts, which afford the bases for demonstrations and verifications. In each case there should be definite and quite complete plans of work prearranged.

Not the least important feature is the record of each plot. This should be concise and complete. Each operation from the breaking of the ground to the gathering of the crop should be described and dated. The conditions of the season, the weather, and the soil should be noted; the rainfall recorded; and no factor that might in any way influence the crop for better or for worse should be overlooked. The hours of labor and all expenditures and receipts should be noted. The accompanying form for making a chronological record has proved quite satisfactory.

AGRICULTURAL DEMONSTRATION FIELD AND HOME PROJECT WORK AT THE OHIO STATE UNIVERSITY

CHRONOLOGICAL PLOT AND PROJECT RECORD

Instructor's Record *Sheet No.* _____

Year *Name and Address of Agriculturist*

Crop or Project *Size, No. or Location of Plot or Project*

Draw map of field to scale on back of first sheet. Give statement of purpose and plan of work on back of second sheet. Keep record strictly up to date.

DATE Month—Day	OPERATION OR OBSERVATION What, When, Where, How, Why, etc.	LABOR Time, Rate, Cost	MATERIALS AND TOOLS USED Quantity, Quality, Wear, Cost	RESULTS Immediate, Final, Production	FINANCIAL ACCOUNT	
					Income	Expenses

When the crop is sold and the cashbook balanced, a profit should be shown. Otherwise the methods of

agriculture employed are not to be recommended. In case of demonstrations conducted to show the inferiority of certain agricultural practices, a deficit may be expected. The same results may also be expected in connection with some experiments. A deficit resulting from any method of agriculture will tend to prove that method an undesirable one. The method of cultivation and care which shows the greatest returns, other things equal, is the one preferred; for the object of scientific agriculture is to secure the greatest production of superior crops at the least cost without deterioration in soil fertility.

It cannot be too strongly emphasized that the demonstration field should be made an economic success to the extent of conducting it on a self-supporting basis. This can be done, and has been done.[1] The number of questionable agricultural practices to be demonstrated in the school field, should therefore be limited during any one year, and extensive experimentation cannot be permitted. It is the chief function of the demonstration field to illustrate and to inculcate good and acceptable practices of agriculture which have been thoroughly tested and verified by the agricultural experiment stations. Examples of bad practices will probably be in sufficient evidence somewhere in the neighborhood to emphasize the good methods of the school demonstration field by way of contrast. Experiments should

[1] See A. G. Fletcher on "Running the School Farm on a Paying Basis" in *The Rural Educator* for June, 1914 (Vol. III, pp. 107–108).

be carried on in about the same degree—considering area and probable economic loss—as can be recommended to the man who is actively engaged in successful farming.

To place the school demonstration field on a paying basis and keep it there, will, of course, require alertness, application, business ability, and industry on the part of the teacher of agriculture and his pupils. Of course, the school and community should be willing to give the subject of school agriculture adequate encouragement, similar to the encouragement which is actually given to the industry by rural society as a whole. Laziness or inefficiency in either pupils or teacher cannot be tolerated. The success of the demonstration field ought to be made the crucial test of the success of the instruction in agriculture. For this reason, credit should not be granted the pupil until after the harvest and sale of the products of his plot—especially, if the undertaking is supposed to be an economic one. The same rule of economic production should also be applied to the teacher of agriculture in order to determine the advisability of his retention as the teacher of this subject.

What is said in reference to the teacher's responsibility must be carefully qualified by the attitude of the community and school toward the subject of agricultural instruction. It is also to be expected that the first cost of purchasing the field and the equipment necessary for its operation will be borne by the school

authorities. The cost of operating and the upkeep should be the basis of calculating the profitableness of the undertaking, and the computation should extend over a number of years, because some unfavorable years might naturally show a deficit. On the other hand, the school farm should not be expected to become a source of revenue to the school or community.

A Suggestive List of Demonstrations, Verifications, and Experiments for the School Demonstration Field

1. *Demonstrations*

By the most approved methods, as advocated by your state agricultural experiment station, or another acceptable authority, raise the following:

Garden Crops

1. One plot of potatoes.
2. One plot of tomatoes.
3. One plot of cabbage.
4. One plot of beets.
5. One plot of onions.
6. One plot onion sets from seed.
7. One plot of beans.
8. One plot of peas.
9. One plot of turnips.
10. One plot of pickles.
11. One plot of squash.
12. One plot of muskmelons.
13. One plot of watermelons.

14. One half plot of radishes.
15. One half plot of lettuce.
16. One half plot of celery.
17. One half plot of peppers.
18. One half plot of assorted flowers.

Other vegetables.

Field Crops

1. Two plots of field corn.
2. One plot of sweet corn for seed.
3. One plot of sweet corn for roasting ears.
4. One plot of pop corn.
5. Two plots of Kafir corn.
6. One plot of wheat.
7. One plot of oats.
8. One plot of buckwheat.
9. One plot of alfalfa.
10. One plot of clover.
11. One plot of timothy.
12. One plot of vetch.
13. One plot of soy beans.

Other field crops.

Small Fruits and Perennials

To be continued at least two years and assigned to one pupil during each year.

1. One plot of strawberries.
2. One plot of raspberries.
3. One plot of blackberries.
4. One plot of roses.
5. One plot of rhubarb.

Additional perennials.

Miscellaneous

Perform one of the following tasks in accordance with approved methods:

1. Prune one or more of the trees of the school orchard or grounds.
2. Plant a tree in the school orchard or grounds and care for it for one year.
3. Raise a plot of apple seedlings.
4. Tongue graft one half of the apple seedlings raised in number 3.
5. Set out the grafted trees into the field nursery plots.
6. Sell the year-old nursery stock from one plot.
7. Raise a plot of peach seedlings.
8. Bud one half of the peach seedlings raised in number 7.
9. Set out the budded stock of number 8.
10. Demonstrate a three-year rotation.
11. Demonstrate the value of a catch crop as a source of humus.
12. Demonstrate the process of inoculating the soil of a plot with soil taken from a field of clover showing tubercles.

Additional agricultural activities may be assigned as tasks.

2. *Verifications*

The agricultural experiment stations have established many facts in regard to the best methods to be followed in agricultural operations which they recommend. Some of these facts need to be verified to make

SCHOOL BOYS AT WORK ON THEIR HOME PROJECTS

their meanings clear and importance impressive. Many farmers need to be "shown." Some of the things that may profitably be verified from time to time in various communities are the following:

1. Wheat grows from seed wheat, and cheat from cheat seed.

2. Better corn is produced by shallow cultivation than by deep.

3. Alternate rows may be planted with corn No. 1 and No. 2, but No. 1 may be kept pure, if all the tassels are removed from No. 2.

4. When white corn becomes crossed with yellow corn, the cross is shown by the presence of reddish or yellowish coloring along the sides of the grains. When the cross is vice versa, the grains are capped with white.

5. Potatoes should be treated for scab before being planted.

6. It pays to spray potatoes.

7. Root crops are injured by the application of lime to the soil in which they are grown.

8. Leguminous crops will not do well in a sour soil; the conditions for their growth can be greatly improved by the use of lime to sweeten the soil.

9. Crops grow better in a drained, than in an undrained soil.

10. A dwarfed apple tree may be produced by grafting an apple scion on a quince root.

11. It pays to spray fruit trees.

12. Certain hardwood plants may be propagated by layering.

3. *Experiments*

It is perhaps admissible for young people to undertake "experiments," provided the problems proposed for solution are not too difficult; but the work necessary for their solution should not be extended over more than two or three years. Experimentation, in its true meaning, is an undertaking for adults who have reached some degree of specialization, each working in the field in which he proposes to make original research. However, pupils in the public schools may be taught and encouraged to investigate by experimentation facts and principles which they do not understand. If possible, the results of such work should not be obtainable in any other way, else, should the pupil learn the fact or principle by reading, his "experiment" becomes merely a verification of something that he already knows to be common knowledge. Public school, even high school, students need not be expected to discover many new things that will enhance to any appreciable degree the sum total of human knowledge. However, these young scientists-in-the-making may profitably learn the method by which new facts and principles are discovered to the race. Also, the scientific method may find a place in the future operations of the farms of which these pupils may become the owners or managers.

The following brief list of experiments will be suggestive; others may readily be added.

1. What is the best depth for planting corn, and why?

2. What is the most economical distance for planting a certain variety of sweet corn? (Judgment to be based on profit.)

3. Will large seed potatoes produce a better crop than small seed potatoes?

4. Is it a good practice to hill potatoes?

5. Is a straw mulch better than a dust mulch for raising the potato crop? From which method will the greater profit be realized?

6. Can a tomato scion be grafted upon a potato stock and two different crops produced by the same plant—a crop of potatoes underground, and a crop of tomatoes above ground?

7. Should tomato vines be staked, or allowed to fall to the ground? Which method will produce more? Will there be any difference in the quality of the product?

8. Which is the better method for cultivating beets, by planting them in the top of ridges or by level culture?

9. Test the soil of all the plots of the demonstration field for acidity.

10. Determine the fertilizer needs of a group of plots.

II. Home Projects

A home project is a thing to be done on the home farm, under the conditions which it presents, involving an application of the student's school training.[1] In other words, it is a definite agricultural task assigned

[1] See Chapter V of the *Report of the Board of Education on Agricultural Education*, which was submitted to the Legislature of Massachusetts, 1911.

to the pupil to be worked out at home. It should be adapted to the pupil's home conditions and restricted in its size to his capabilities. The home task is supposed to be under the direction of the teacher of agriculture, yet the pupil's home folks coöperate with him in carrying the project forward to a successful issue. The school furnishes the knowledge and the direction, while the home gives suitable encouragement and help.

In beginning a series of projects in any community, care should be used not to undertake anything too difficult. If there is a similarity among several of the projects, a certain amount of competition may be evoked, while the work may be more easily directed by the teacher in charge. When the workings of the plan have become more familiar to the teacher, the pupils, and the community, more comprehensive projects, and a greater variety of them, may be undertaken with greater assurance of success than if large undertakings were attempted in the beginning.

The principle of economic results, which involves the keeping of a record of the project, as well as other principles set forth in connection with the demonstration-field projects, are also valid in connection with this home work. The home project is usually a larger undertaking than the work on the demonstration field, and may be carried on with animals as well as with plants. There will, as a rule, be a greater variety of activities open to the project phase, and work with farm animals is especially favored. The scholastic work of the school

should anticipate and be coördinated with the projects of the pupils.

The home project and the demonstration garden are frequently placed in antithesis in respect to their relative merits in agricultural instruction; nevertheless, we shall not here consent to employ this method of comparison. Both have their legitimate places in modern rural education and under various conditions each may in turn be very satisfactorily used.

In many educational systems it will be found advantageous to use both methods for securing to the pupils the practical experience which they need to round out their theoretical agricultural training. The demonstration field will furnish land for landless pupils. Both plans will be found valuable for extending the most approved methods of agriculture to the farming communities.[1]

A List of Home Projects

The following list of home projects may be found suggestive to beginners:

1. The raising of an acre of corn with profit.
2. The raising of one fourth acre of potatoes for profit.
3. The raising of one tenth acre of tomatoes and canning them, showing profit.
4. The raising of an acre of wheat with profit.

[1] See C. G. Selvig on *Home Project vs. Laboratory and School Garden Plat Work for High School Students* in addresses delivered before the Washington meeting of the American Association for the

5. The raising of an acre of oats with profit.

6. The raising of a quarter-acre of melons for profit.

7. The raising of a quarter-acre of strawberries for two years for commercial purposes.

8. The raising of ten apple trees, developing them from the seed, budding five, and grafting five of the seedlings.

9. The raising of one acre of alfalfa and keeping of record to show profit or loss.

10. The raising of a calf.

11. The raising of a colt.

12. The raising of two pigs.

13. The raising of two sheep.

14. The raising of a cat.

15. The raising of a dog.

16. Plant and care for two flower boxes with areas of not less than 5 square feet each.

17. Plant and care for the family garden.

18. The raising of a brood of chickens (with hen), keeping cost record to determine final profit.

19. Raise a brood of chickens using incubator and brooder.

20. Raise one fourth acre of pop corn, and present record of cost and receipts.

21. Keep the expense and receipt record of the farm for one year.

Advancement of Agricultural Teaching, Nov., 1913. Bulletin, U. S. Bureau of Education, 1914.

Also William T. Bawden in *Vocational Education* for November, 1913, pp. 86–105.

Stimson, R. W.: *The Massachusetts Home Project Plan of Vocational Agricultural Education*, Bulletin, 1914, No. 8. U. S. Bureau of Education, Washington, D. C.

22. Keep an itemized account of all farm or home incomes and expenditures for 30 days.

23. Keep an itemized account of producing and marketing a field of not less than ten acres of corn.

24. Plan and carry out a three-year rotation of crops.

25. Plan and build a strip of road.

26. Investigate and purchase the materials for a fence, and build it.

27. Plan, estimate the cost, purchase the materials for a ditch, and dig it.

28. Try out three kinds or brands of fertilizers on the home place.

29. Test five kinds of fertilizers on section plots in a cornfield.

30. Feed one or two cows with balanced rations and note the effect on production as compared with previous ratio of production with cows not scientifically fed.

31. Feed an animal for sixty days. (Pupil to determine the ration, keep cost and production record for profit.)

32. Feed a pig for two months, keeping a cost record of labor and feed to determine the profit.

33. Test and weigh the milk from two or more cows daily for one week each month throughout one year.

34. Weigh and test the milk of one cow for thirty days.
(Testing once each day, alternating morning's and evening's milk.)

35. Produce one fourth acre of roasting ears and present record showing all expenses and incomes to show profit or loss.

36. Spray a small orchard of about 25 trees.

37. Prune three different kinds of fruit trees by acceptable methods.

38. Set out twenty-five orchard or shade trees.

39. Care for 3–5 fruit trees for one year.

40. Cultivate ten acres of corn.

41. Plow five acres of ground with a breaking plow.

42. Treat a peck of seed potatoes for scab and compare production with that of an untreated peck.

43. Treat ten bushels of seed wheat for stinking smut with the formalin treatment.

44. Plan and plant the home yard for beautification. (Cost record to be kept and enhanced value of property to be determined by three disinterested persons.)

45. Study twenty common farm birds with special reference to their identification, habits, and economic worth or nuisance.

46. Collect, identify, and mount twenty common farm weeds.

47. Collect twenty common insects, presenting the various stages of five. Identify and give economic importance.

48. Make a survey of a community with reference to neglected machinery exposed to the weather.

49. Make a corn tester, and test twenty-five ears of seed corn.

50. Make a sawbuck.

51. Build a hog cot.

52. Make a set of doubletrees.

Note.—A list of fourteen vegetable projects, with detailed directions for carrying them out, will be found in Bulletin No. 1, 1911, of the Massachusetts State Board of Education, Boston, entitled *Agricultural Projects for Elementary Schools;* also pp. 15–23, Bulletin

No. 10 (December, 1912) entitled, *Junior Agricultural Association of Michigan for Boys*, Department of Agricultural Education, Michigan Agricultural College, East Lansing. *Project Study Outlines for Vegetable Growing* are the subjects of two bulletins issued by the Massachusetts State Board of Education (Boston), Numbers 5 (1912) and 9 (1913). *Home Projects for School Agriculture* by A. W. Nolan, bulletin, 1913, State College of Agriculture, Urbana, Ill.

Review of Chapter XIII

State briefly—

Why school gardens have not succeeded well in the rural districts. How the school garden has become an adjunct to the city schools. The titles and authors of some of the leading books and bulletins on school gardens. The purpose of the demonstration field. The recommendations made in reference to the size of the field and the individual plots. The method of arrangement for the plots, and other details with reference to their management. The reasons for having a "common lot." Some of the problems to be worked out in connection with the plots. The items to be noted in a plot record. The reasons why the demonstration field should be made an economic success. How both the pupil and the teacher of agriculture may be held responsible for making the demonstration field economically successful. The distinguishing difference among the *demonstration*, the *verification*, and the *experiment*. Name a few of each. What is meant by the home project? Some of the things to be kept in mind in beginning home-project work in any community. Some of the advantages of the home-project method. Any disadvantages. What kind of work may be used for home projects?

CHAPTER XIV

BOYS' AND GIRLS' AGRICULTURAL CLUBS

I. Agricultural Clubs in General

Boys' and girls' clubs are to the formal school work in agriculture and home economics what the literary society is to the formal classroom course in English. The theoretical knowledge that has been gained at school is applied in the club work; and the art side of these practical subjects, which is so important and which cannot well be developed under school conditions, is given abundant opportunity to contribute its share to the education of the boy and girl. The club idea may be regarded as the democratic substitute for the apprentice system of monarchical times: it places a premium on initiative instead of on blind imitation and subservient dependence upon explicit and minute direction; it encourages independence and ownership rather than servitude for the enrichment of another; it encourages economic production instead of extravagant methods of husbandry; it instills the idea of the dignity of labor and emphasizes the disgrace of idleness; it provides for economic, intellectual, and social rewards to the youth who distinguishes himself in its activities.

A club is an association of boys and girls who enter into a competition to determine who can grow, or make

the most and best products under certain rules, and to exhibit samples of their products. There are many kinds of agricultural clubs, as corn clubs, wheat clubs, potato clubs, tomato clubs, cotton clubs, tobacco clubs, pig clubs, poultry clubs, etc. Each club is usually named for that particular farm product to which special attention is directed with reference to learning about the best practical methods for its production. Sometimes the club undertakes several farm activities, and then it is usually designated as an agricultural club; and this would seem to be the trend of development, particularly as the club comes to be more favorably regarded with each passing year, as a desirable auxiliary organization of the public school system.

The purposes of the club, as explained by Mr. O. H. Benson, U. S. specialist in charge of club work are as follows: "To arouse interest and wholesome respect for the farm and the rural home in every member at the opportune time; to teach children the elementary lessons of agriculture and true home life, and to carry to them the useful and practical information that has been established into facts at experiment stations and crystallized in the classroom; to encourage club members to be constructive citizens, producers as well as consumers; to teach and demonstrate on the home acres that greater yields at less expense on less acres are entirely possible in American agriculture; to show the relations of the club acre, garden plot, and home interest

to our common school, its classroom, and the textbook by systematic correlations." [1]

The promoting agencies of clubs are various. In many instances they are local organizations intimately connected with the agricultural work of the schools. This is, without question, the best attachment of agricultural clubs for educational purposes. In some states the agricultural colleges are the active promotors, while in others this work is in the charge of the agricultural experiment station, the state department of agriculture, or the state department of education. Sometimes two or more of these agencies coöperate in the advancement of club work. The office of Farm Management in the United States Department of Agriculture has, in recent years, been very active in promoting club work in coöperation with some agency in the various states. The success of the plan was quite phenomenal in the Southern states and is now developing very rapidly in the Northern states. The purpose has been expressed of extending the plan to every state of the Union.[2]

The county Y. M. C. A. has been very active in the organization of clubs among country boys and girls with good success. Other organizations have likewise

[1] See *The Rural Educator*, Vol. I, p. 30.

[2] Complete information as to the methods of organization, coöperation, and plan of work may be secured by addressing Mr. O. H. Benson, Specialist in charge of Club Work, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C.

been active, as Farmers' Institute organizations, and country churches. The popular nature of the club is apt to make it especially liable to abuse for commercial and political purposes. Taking the county as a whole, and speaking of the various kinds of rural industrial clubs, we may still liken them to a species of wild animal in the educational world, which is potential with possibilities, but which needs yet to be tamed and harnessed. To be most serviceable as an aid to education, the club needs to become a recognized auxiliary of the public schools, under its control and management, and contributory to its best teaching and highest aims in rural and agricultural teaching. Under the patronage of the public schools, the club idea seems destined to reach its highest function of serving public education and industrial development among the young people of the country. In this relationship both its efficiency and its economy will be best served. The county superintendent of schools seems to be the most logical officer to direct and supervise, in a general way, club activities for educational purposes; while the direction of the individual club workers should be one of the duties of the teacher of agriculture in the local school.

II. The Scioto Corn Club [1]

One of the best typical agricultural clubs I have ever known was developed by a township superintendent,

[1] See *The Rural Educator*, Vol. I, pp. 53–56. The writer is indebted to Mr. T. W. Horton for this sketch.

T. W. Horton, in one of the hill counties of Ohio. An account of this club is here given in the hope that it may be useful as an object lesson for those who desire information and encouragement in forming and conducting a similar organization in connection with their schools.

The membership of the Scioto Corn Club reached a few more than one hundred from a total enrollment of 180 pupils in the township schools. A premium list, with rules, was adopted, officers were chosen, and committees appointed. Each school was represented on the committees, there being seven rural schools in the township, including the one-room, township high school. The farming land of the township varies in fertility from the best bottom farms to the bare hilltops, which are very low in productiveness. Nearly all conditions in rural life are present, so that the facilities and materials for forming an organization were no more promising than will be found in any average rural community of the Middle West.

The preparation of pupils and patrons for the work of the club was the first and most important consideration. The means used were such as are at the disposal of every other rural school. In order to cause the people to feel a community of interests, and to invite their coöperation, central meetings of all the schools were occasionally held at which programs of various kinds were carried out. Parents were asked to visit the high school and listen to the talks on agriculture that

were given to the pupils. The pupils wrote requests for farm bulletins at the direction of the teachers and were furnished bulletins setting forth the work of the corn clubs in other states. Speakers were secured from the College of Agriculture for public meetings. The board of education generously paid all expenses incident to the organization and also allowed the superintendent additional salary for keeping in touch with the children by correspondence and visits during the summer vacation.[1] The vacation period was occupied by the boys in growing crops and poultry. Some of the girls engaged in the same work and succeeded well. During the first two months of school nature-study collections were made and the girls finished their needlework under the direction of the teachers and parents. The girls also practiced for the baking contests at home. This was work they were induced to do outside of school hours; otherwise it would probably not have been done.

The exhibition was held on the last day of October. One hundred boys and girls made over three hundred entries. The showing was very creditable for the first effort. The experience gained will make each succeeding year's work more profitable and useful. A premium had been offered to the school having the best display,

[1] It will be readily seen that the introduction of agriculture into the rural and village schools may lead to the desirability, if not the necessity, of employing the teacher of agriculture twelve months of the year instead of from six to nine as is now the common practice. It would be a blessing to both the nation and her teachers, if the profession of teaching were placed on such a financial basis.

so that each school had to be provided with a separate table for its exhibits. No prizes of value were given for anything. The honor of being winner was the only inducement for contesting, aside from the practical benefit derived. Neatly printed ribbons were given as marks of honor.[1] The district supervisor of agriculture for the southwest district of the state was a visitor and made an address. Two professors from Ohio State University did the judging and delivered addresses. A public dinner was served by the ladies of the township, thus affording the people an hour of pleasant social intercourse.

A very noticeable result of this work is that more of the people are taking a deeper interest in the schools and, by request of the patrons the organization has been continued. Boys are interesting themselves in farm work who never before showed any inclination to do so. The idea is keeping the boys on the farm and eventually there may be no necessity for the cry, "Back to the farm." A feeling of loyalty to the schools on the part of pupils and teachers has been created and

[1] The educational expediency of giving prizes at the various kinds of agricultural, domestic science, and industrial exhibits is very seriously questioned. The resulting ideals that frequently become fixed in the life of a child from competing for some economic object may lead to the placing of erroneous values upon the activities of life. Doubt has been expressed as to the successful issue of industrial contests by school children without the offering of valuable prizes. Supt. Horton has shown that it can be done. It is hoped that all others will follow his example.

An Oregon boy who raised eleven and a half bushels of potatoes from one seed potato in one season and was awarded the prize in the state potato-growing contest.

The winner of the first prize in the bushel, single-ear, and ten-ear corn contest in a county of Indiana.

the schools are becoming what they ought to be—the social centers of the community. Added dignity has been given to farm and home work in the eyes of the boys and girls. If the exhibit of a child's work is worthy of the attention of his neighbors and friends, he thinks the work of producing it is a worthy thing for him to do.

Each member of the club reported his experiences to the teachers and the superintendent. By this means good work in English was secured which was spontaneous and natural.

In organizing this kind of work, one should have a definite aim, a special line of work to develop, and require that this and no other be done; otherwise the exhibits will be too diverse. Too great diversity will create confusion and the children will lose sight of the end to be accomplished. Emphasis should be put upon the rule that a child must not exhibit an article that is not a product of his own labor. Require each pupil to keep a complete and continuous record of his agricultural operations. Give the parents an opportunity to show their own products, but make their exhibition separate from those of the schools. Although some of the things produced by the members of a club may have no commercial value, yet it may serve a purpose from the standpoint of industrial education; for, when we educate the hand, we educate the mind also, and a beginning must be made somewhere. A child's efforts will be greater if his finished work is to be placed on exhibition. If a superintendent or teacher

is willing to do plenty of patient, earnest work, he will find that the children's agricultural clubs afford a splendid opportunity to do really constructive work in creating school sentiment. Instead of taking time from the regular school studies, it really gives added force to them, for interest created in one department is contagious and will extend to others. Boys and girls should be so trained, and their school life so directed, that when they leave school and enter their chosen vocations, there will be as little friction as possible in the adjustment to their new surroundings. It is quite apparent that, with agriculture and rural home-life problems intelligently and carefully taught in the schools, the country children are coming into their true and rightful inheritance.[1]

Club Rules

1. All articles entered in contest must have been produced by the exhibitor.

2. Each entry must be accompanied by a detailed record of production.

3. Only ribbon awards are offered; blue for first and red for second on each entry.

4. Contests are only for pupils of ———— schools. Other residents of the township are asked to make entries at the exhibition in a separate class.

[1] When one knows the situation in Scioto Township, where Superintendent Horton is carrying forward this excellent work with such splendid success, one cannot resist the conviction that he is unconsciously solving two great problems, at least in his own township, that are of special interest to school teachers. By getting the patrons

5. Each pupil exhibitor should write a composition of not less than 200 nor more than 800 words telling all his experience in production. A prize is offered for the best one.

6. Schools will be dismissed the day before the exhibition when all articles except classes B and G must be entered and arranged.

7. Contests must be limited to those articles mentioned in the premium list. Other articles may be put on tables for show only.

8. Only one entry will be allowed each person for any one premium.

9. The school committees are to assist the judges when making awards and otherwise help as suggested by the teachers.

10. Record blanks may be secured from the officers and from the chairmen of the committees.

11. A premium will be given to the school having the best exhibit.

12. There will be three classes for contests as follows: children under ten; ten years and over; high school.

13. Each exhibitor will be given a number, and this number will be placed on all his exhibits. No exhibits may bear the names of exhibitors.

I. *Premium List*

The following premium list is meant merely as a suggestive one. Only those things should be listed

of his district intensely interested in their schools by appealing to them through their own vocation, they are unwilling that he should leave his work there and go elsewhere; and thus it happens that his tenure of office and salary are more satisfactorily arranged.

that appeal to the community, or upon which it is desired to place special emphasis. For the first year it is highly desirable to make the list as short as may be consistent with the needs of the schools. The list may be lengthened as the club gains in experience:

Class A.—Farm Crops

1. Acre yield white corn.
2. Acre yield yellow corn.
3. One tenth acre white corn.
4. One tenth acre yellow corn.
5. 10 ears white corn.
6. 10 ears yellow corn.
7. 10 ears white pop corn.
8. 10 ears yellow pop corn.
9. 10 ears sugar corn.
10. Largest ear white corn.
11. Largest ear yellow corn.
12. Tallest stalk of corn.
13. Best yield bush beans.
14. Best yield pole beans. (Plots of beans to contain 150 sq. ft.)
15. Peck yellow sweet potatoes.
16. Peck white sweet potatoes.
17. Peck red sweet potatoes.
18. Peck onions.
19. Peck turnips.
20. Peck beets.
21. Peck potatoes.
22. Largest squash.
23. Largest crook-neck squash.
24. Largest pumpkin.
25. Largest sunflower.
26. Largest cabbage.
27. Best 5 beets.
28. Best 5 turnips.
29. Best 5 radishes.
30. Best 5 mangoes.
31. Quart of peanuts.

Class B.—Culinary Articles

32. Loaf white bread.
33. Plate of rolls.
34. Layer cake.
35. Solid cake.

36. Plate cookies.
37. Best pie.
38. Corn bread.
39. Roll of butter.

Class C.—Canned Goods

(Quart cans only.)

40. Peaches.
41. Apples.
42. Pears.
43. Quinces.
44. Beets.
45. Cucumbers.
46. Blackberries.
47. Cherries.
48. Grapes.
49. Plums.
50. Tomatoes.
51. Corn.
52. Beans.
53. Glass of jelly.

Class D.—Fruits

54. Plate 5 apples.
55. Plate 5 pears.
56. Plate 5 quinces.
57. Plate 5 peaches.
58. Plate 5 bunches of grapes.
59. Quart basket plums.
60. Quart basket apricots.

Class E.—Sewed Articles

61. Gingham apron.
62. Dust cap.
63. White apron (embroidered).
64. White apron (plain).
65. Fancy apron (colors).
66. Calico apron.
67. Handkerchief (plain).
68. Handkerchief (fancy).
69. Handkerchief (hemstitched).
70. Doily.
71. Stand cover.
72. Pillow top.
73. Quilt block (cotton).
74. Quilt block (wool).
75. Doll dress (white).
76. Doll dress (colors).
77. Dressed doll.
78. Clothespin doll.
79. Pincushion.
80. Towel (hemstitched).

81. Bonnet (colors).
82. Bonnet (white).
83. Hair receiver.
84. Doll apron.
85. Patch.
86. Buttonholes.

Class F.—Farm Manual Training

87. Model sled.
88. Model harrow.
89. Model planker.
90. Model gate.
91. Model poultry house.
92. Model table.
93. Bird house.
94. Seed collection.
95. Wood collection.
96. Leaf collections.

Class G.—Small Farm Animals

97. Trio of chickens.
98. Trio of ducks.
99. Pair Belgian hares.
100. Two pigs.
101. Two sheep.
102. Two goats.
103. Calf.
104. Colt.
105. Dog.
106. Cat.

II. *Vegetable Record*

_____
Name of Club

Name of contestant_____
Address_____
Preparation of seed bed_____
Kind of soil_____ Area of plot_____
Kind of vegetables_____
Where was seed obtained?_____
Kind of fertilizer _____
Date of planting _____
Depth planted _____
Date plants appeared above ground_____

Dates of cultivation, how and why_____

_____

Date of harvesting_____

Quantity (by weight) harvested_____

Signed by witness, outside of family, who can say that the crop was produced and harvested by contestant.

Name _____Address_____

_____

_____ Sec'y.

Pres.

III. *A Short List of Helpful Books*

"Boys' Agricultural Clubs," by Dick J. Crosby. *U. S. Department of Agriculture Year Book for 1904*, pp. 489–496.

"Boys' and Girls' Agricultural Clubs," by F. W. Howe, *Farmers' Bulletin 385, U. S. Department of Agriculture, 1910.*

"Elementary Agriculture and Industrial Clubs," by H. W. Foght, Chapter XI, in his *The Rural School.* The Macmillan Company, New York, 1910.

"Boys' Agricultural Clubs," by B. M. Davis, Chapter XII in his *Agricultural Education in the Public Schools.* The University of Chicago Press, 1912.

The Rural Educator (Columbus, Ohio). See index to volumes.

Review of Chapter XIV

Answer these queries—

Of what benefit are boys' and girls' clubs? Define boys' and girls' clubs. What are their acknowledged purposes? What are their chief promoting agencies? What of their relations to the public schools? Under what conditions was

the Scioto Corn Club organized? How were the pupils and the patrons prepared for the work of the club? How was the exhibition conducted? What do you think of the educational expediency of offering valuable prizes at contests? What are some of the important considerations to be kept in mind in organizing club work? How may club work aid in the solution of the problems of salary and tenure of office for teachers?

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